US009256420B2

(12) **United States Patent**
Adler et al.

(10) **Patent No.: US 9,256,420 B2**
(45) **Date of Patent: Feb. 9, 2016**

(54) **SYSTEM AND METHOD FOR AUTOMATICALLY UPDATING THE SOFTWARE OF A NETWORKED PERSONAL AUDIOVISUAL DEVICE**

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(73) Assignee: **BBY SOLUTIONS, INC.**, Richfield, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/459,906**

(22) Filed: **Aug. 14, 2014**

(65) **Prior Publication Data**

US 2015/0040118 A1 Feb. 5, 2015

Related U.S. Application Data

(63) Continuation of application No. 13/596,364, filed on Aug. 28, 2012, now Pat. No. 8,839,224, which is a continuation of application No. 11/845,027, filed on Aug. 24, 2007, now Pat. No. 8,261,256.

(Continued)

(51) **Int. Cl.**

G06F 9/445	(2006.01)
G06F 1/16	(2006.01)

(Continued)

(52) **U.S. Cl.**

CPC ***G06F 8/65*** (2013.01); ***G06F 1/1626*** (2013.01); ***G06F 1/1643*** (2013.01);

(Continued)

(58) **Field of Classification Search**

None

See application file for complete search history.

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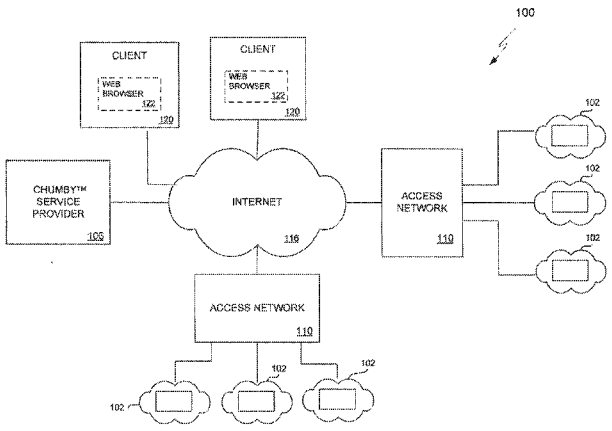
Primary Examiner — Chuck Kendall

(74) *Attorney, Agent, or Firm* — Schwegman Lundberg & Woessner, P.A.

(57) **ABSTRACT**

A method for automatically updating software executed by an electronic device is disclosed herein. The method includes receiving, at the electronic device, an update indication from a server that updated software is available for the electronic device. The method further includes modifying, in response to the update indication, a boot state of the electronic device and initiating operation of the electronic device in an update mode. The updated software is received, at the electronic device, during operation in the update mode. The method further includes initiating, upon determining the updated software has been correctly received, operation of the electronic device in a normal mode.

20 Claims, 61 Drawing Sheets



Related U.S. Application Data

(60) Provisional application No. 60/805,830, filed on Sep. 5, 2006, provisional application No. 60/823,491, filed on Aug. 24, 2006, provisional application No. 60/823,493, filed on Aug. 24, 2006, provisional application No. 60/823,496, filed on Aug. 24, 2006, provisional application No. 60/945,900, filed on Jun. 22, 2007, provisional application No. 60/869,297, filed on Dec. 8, 2006.

(51) **Int. Cl.**

G06F 1/20	(2006.01)
G06F 3/041	(2006.01)
G06F 3/0481	(2013.01)
G06F 9/44	(2006.01)
G06F 21/31	(2013.01)
H04L 29/08	(2006.01)
H04M 1/725	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 1/1656*** (2013.01); ***G06F 1/1684*** (2013.01); ***G06F 1/203*** (2013.01); ***G06F 3/0418*** (2013.01); ***G06F 3/0481*** (2013.01); ***G06F 9/4443*** (2013.01); ***G06F 21/31*** (2013.01); ***H04L 67/025*** (2013.01); ***H04L 67/10*** (2013.01); ***H04L 67/125*** (2013.01); ***H04L 67/303*** (2013.01); ***H04L 67/34*** (2013.01); *G06F 2221/2129* (2013.01); *H04M 1/7253* (2013.01)

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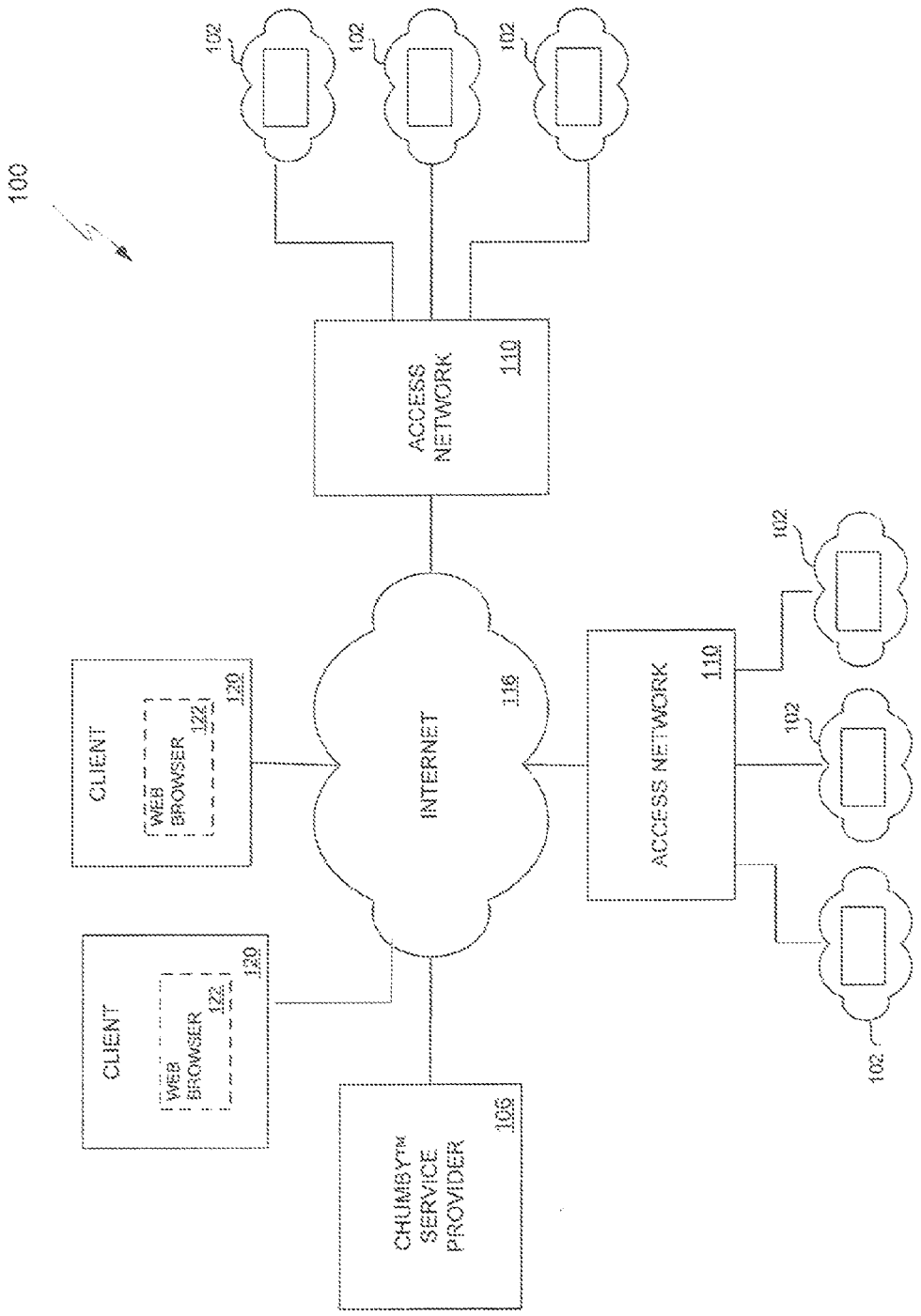
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102
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110
INTERNET
116
CLIENT
WEB BROWSER
122
120
CLIENT
WEB BROWSER
122
120
CHUMBY™ SERVICE PROVIDER
105
ACCESS NETWORK
110
102
102
102

FIG. 1

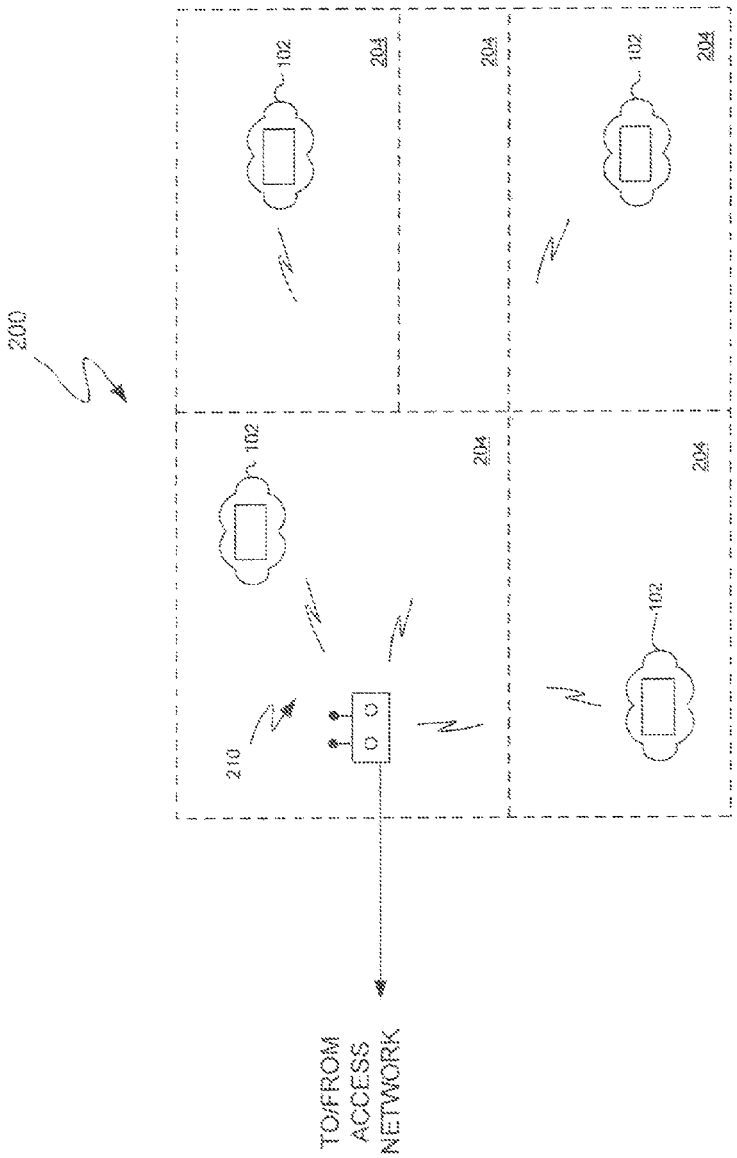


FIG. 2

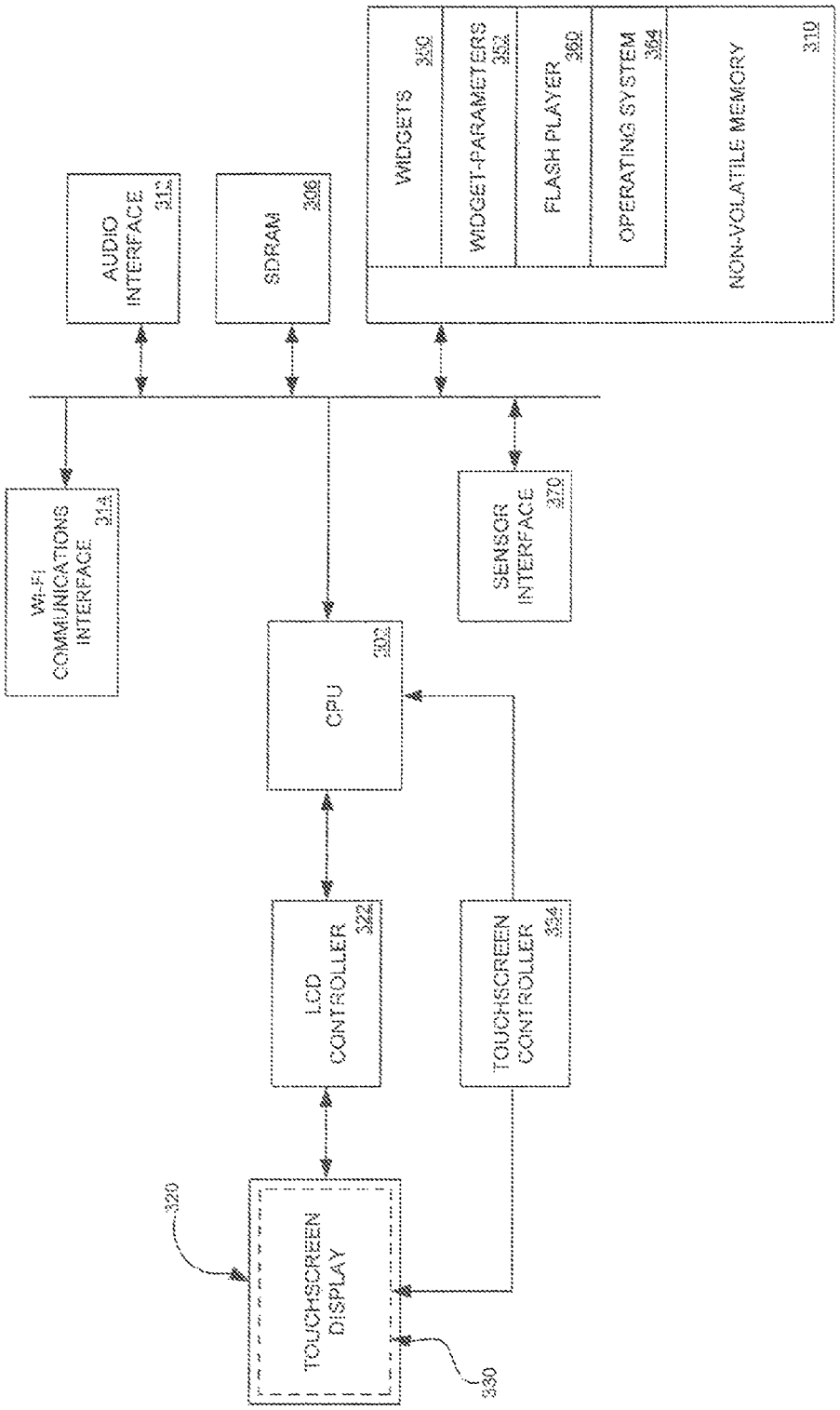

NON-VOLATILE MEMORY 310
OPERATING SYSTEM 354
FLASH PLAYER 360
WIDGET-PARAMETERS 352
WIDGETS 350
SDRAM 306
AUDIO INTERFACE 312
Wi-Fi COMMUNICATIONS INTERFACE 314
SENSOR INTERFACE 370
CPU 302
LCD CONTROLLER 322
TOUCHSCREEN CONTROLLER 324
TOUCHSCREEN DISPLAY
320
330

FIG. 3

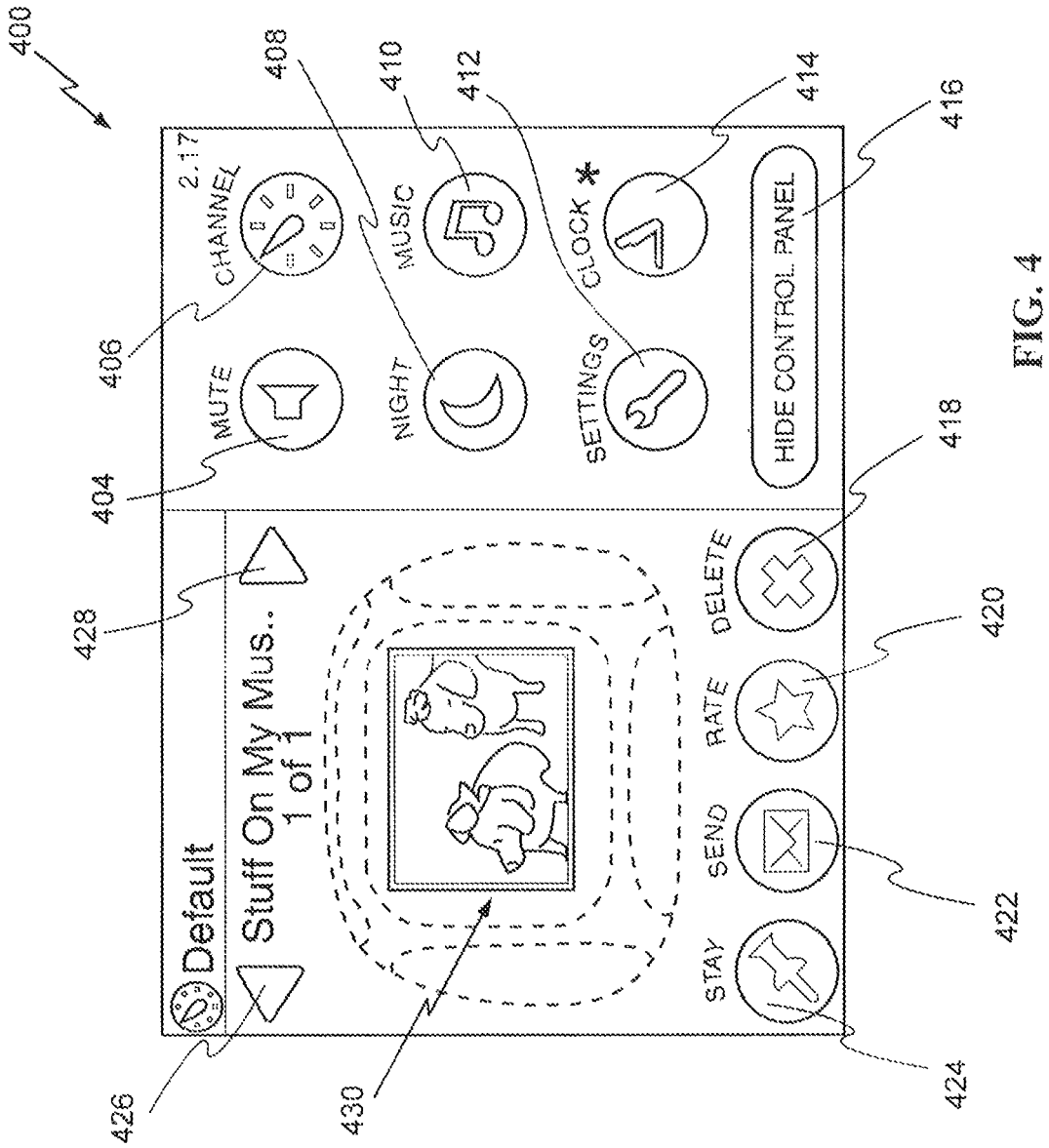

400
408
410
412
414
416
2.17
CHANNEL
MUSIC
CLOCK
HIDE CONTROL PANEL
406
MUTE
NIGHT
SETTINGS
404
418
428
DELETE
Default
Stuff On My Mus..
1 of 1
420
RATE
SEND
422
STAY
426
430
424

FIG. 4

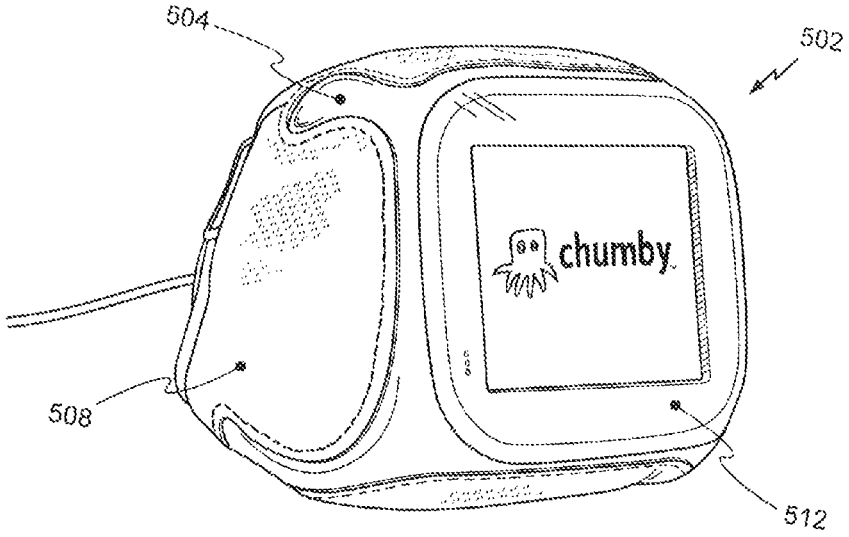


FIG. 5A

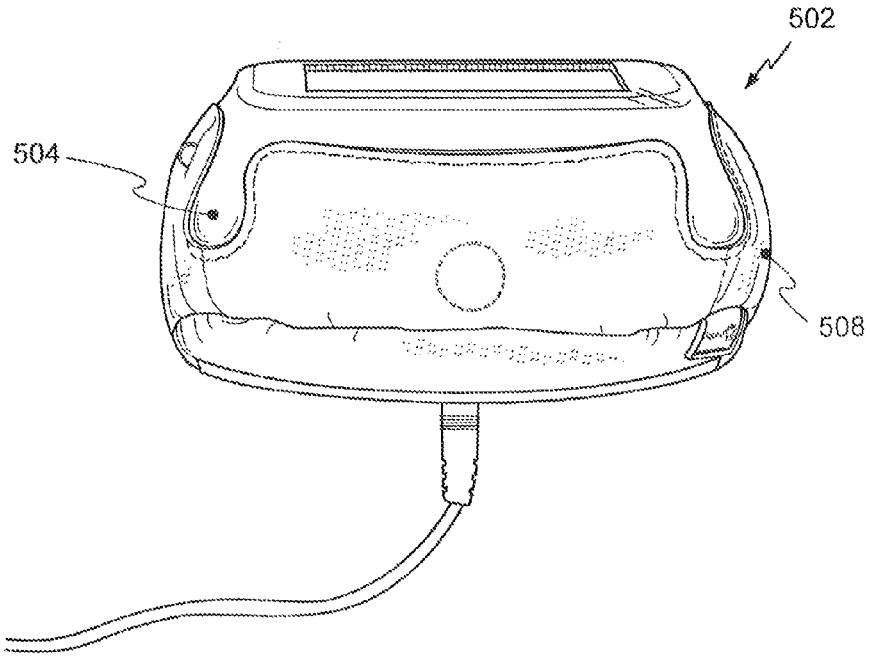


FIG. 5B

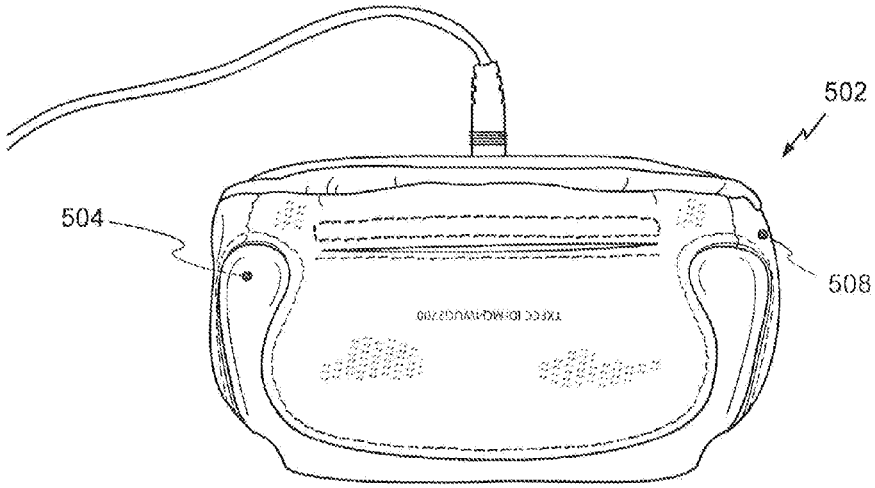


FIG. 5C

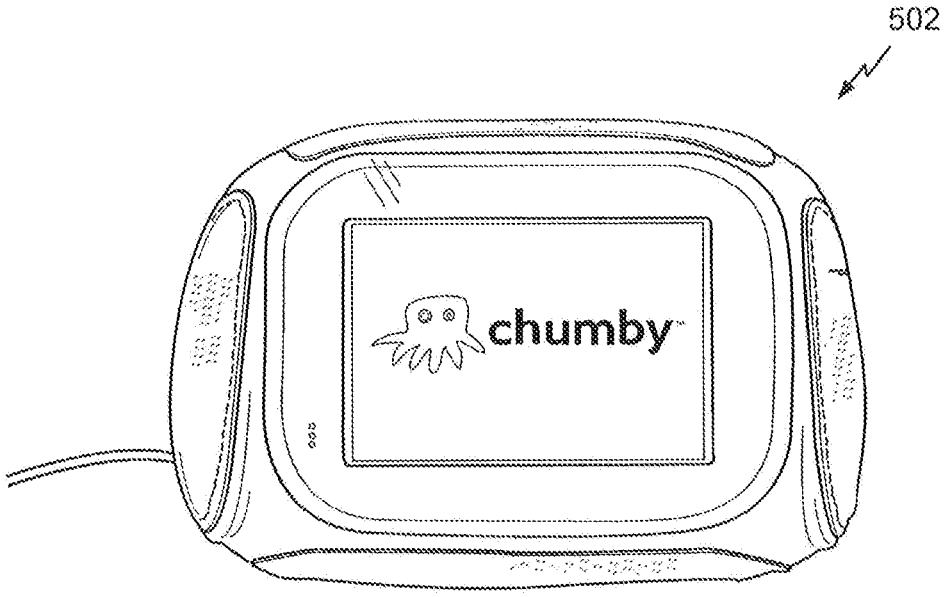


FIG. 5D

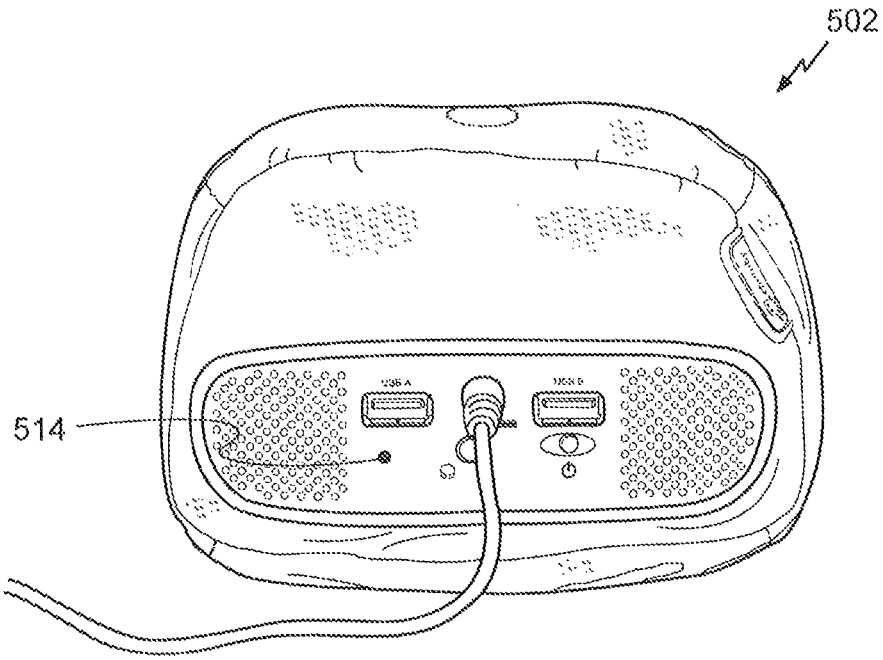


FIG. 5E

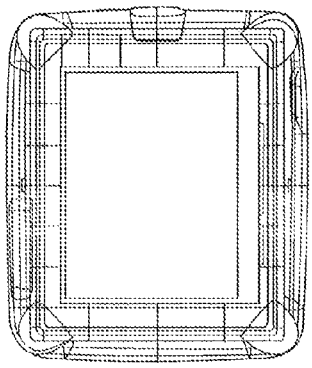


FIG. 6B

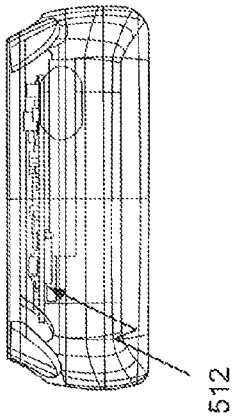


FIG. 6D

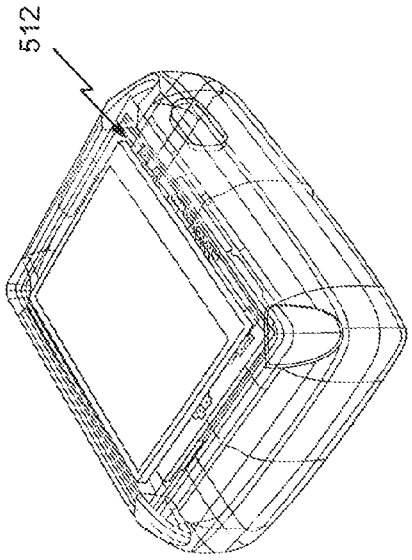


FIG. 6A

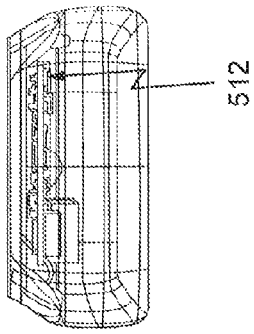


FIG. 6C

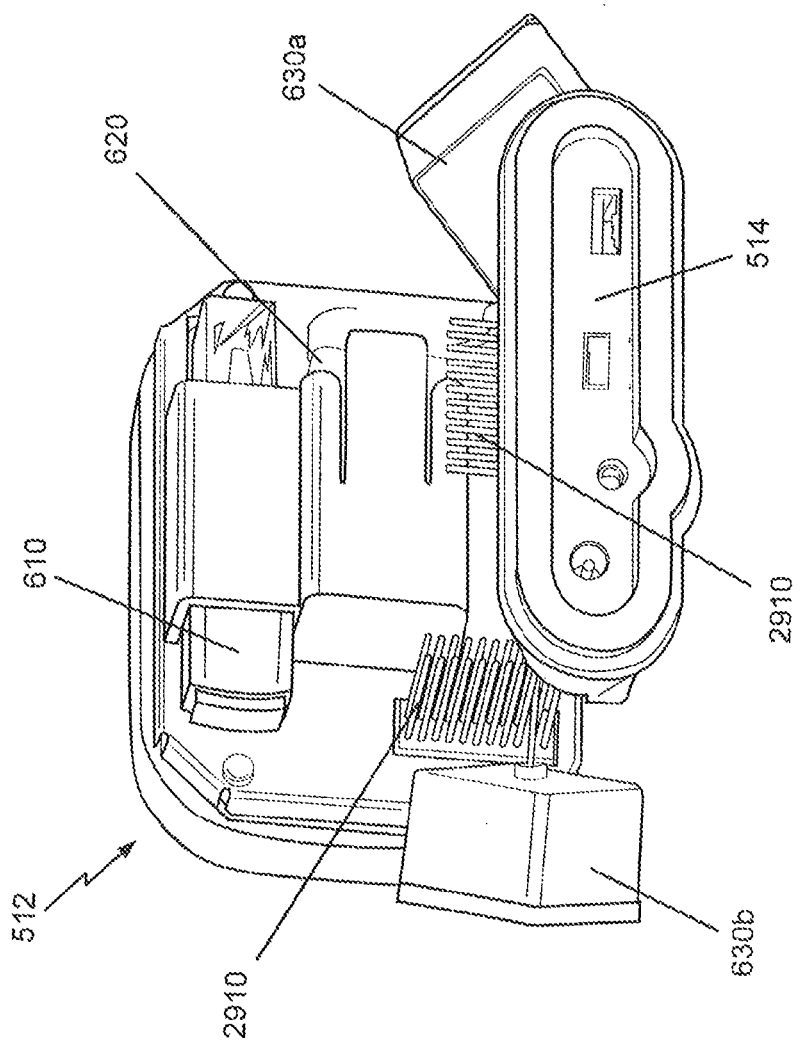


FIG. 6E

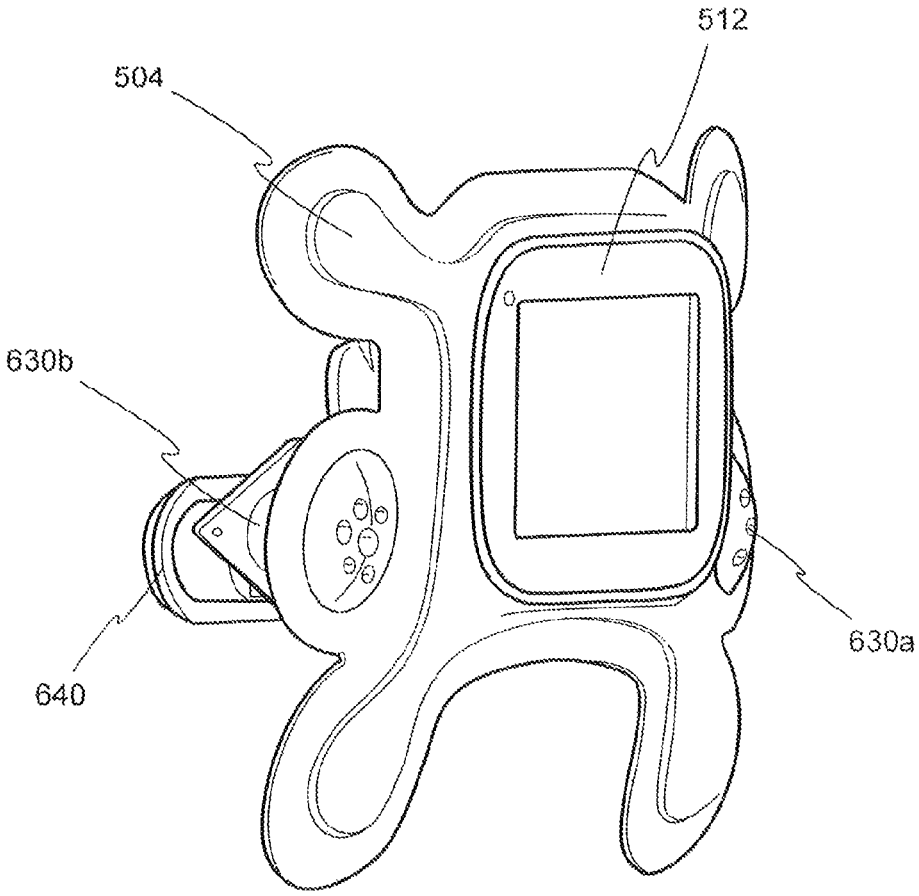


FIG. 6F

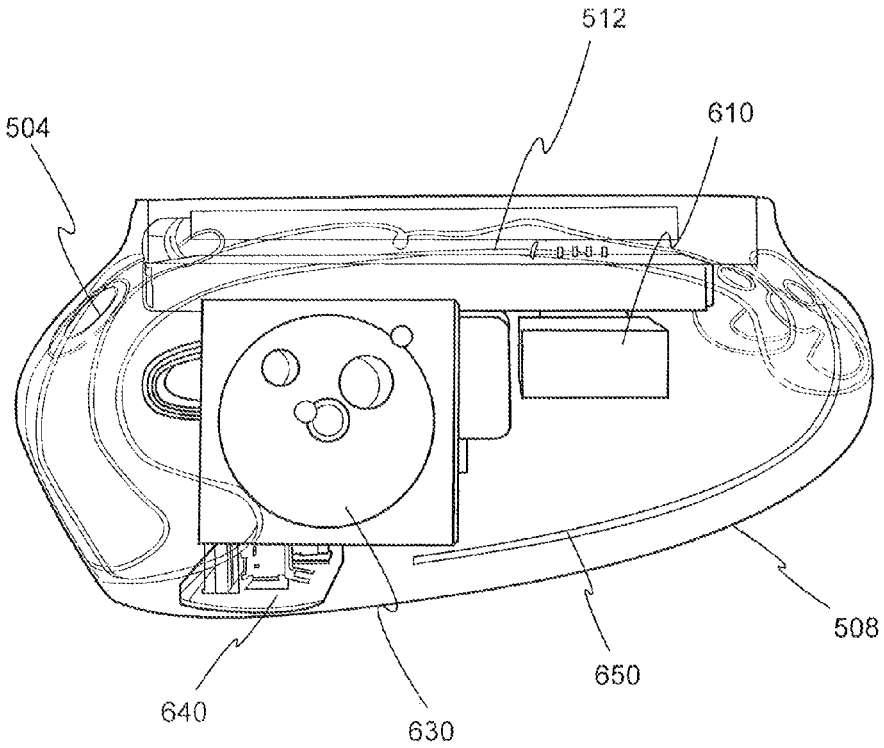


FIG. 6G

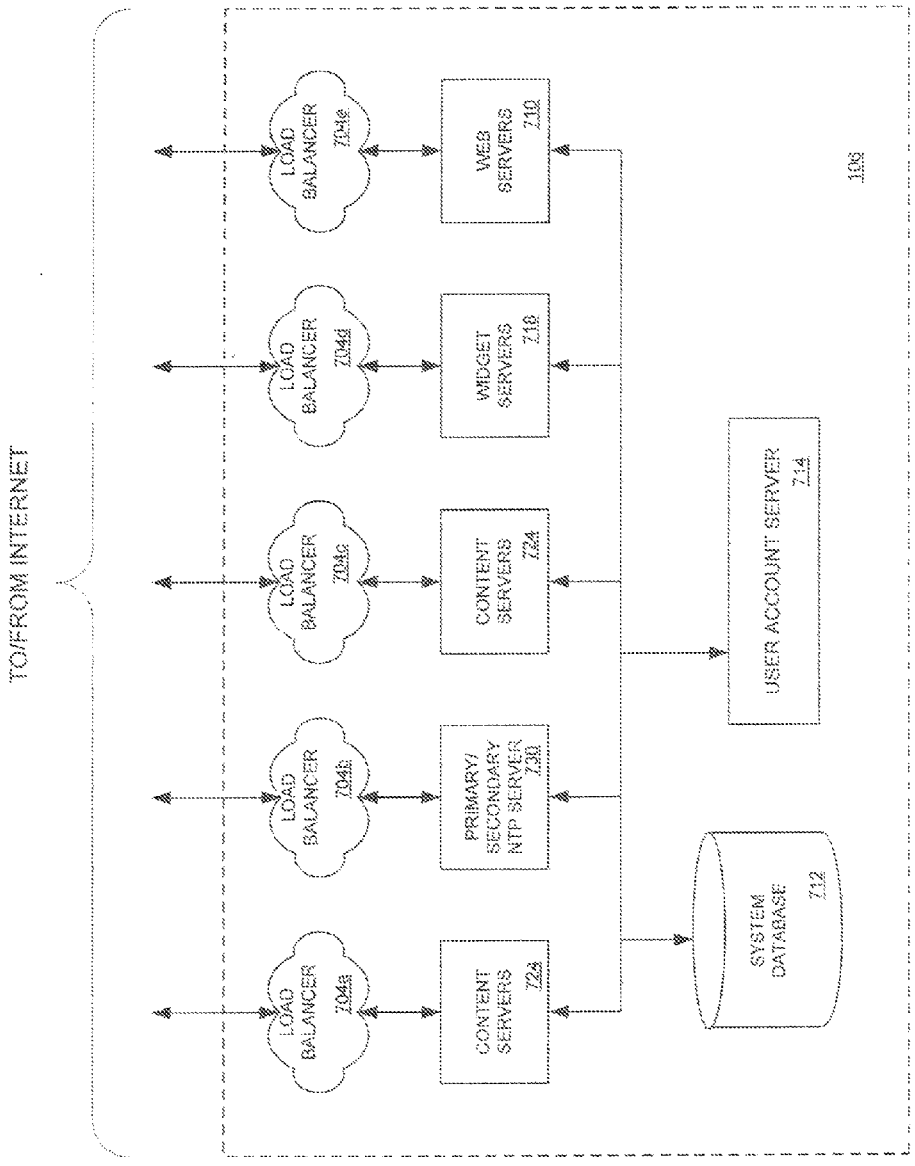

TO/FROM INTERNET
LOAD BALANCER 704a
LOAD BALANCER 704b
LOAD BALANCER 704c
LOAD BALANCER 704d
LOAD BALANCER 704e
CONTENT SERVERS 724
PRIMARY/ SECONDARY NTP SERVER 730
CONTENT SERVERS 724
WIDGET SERVERS 718
WEB SERVERS 710
SYSTEM DATABASE 712
USER ACCOUNT SERVER 714
100

FIG. 7

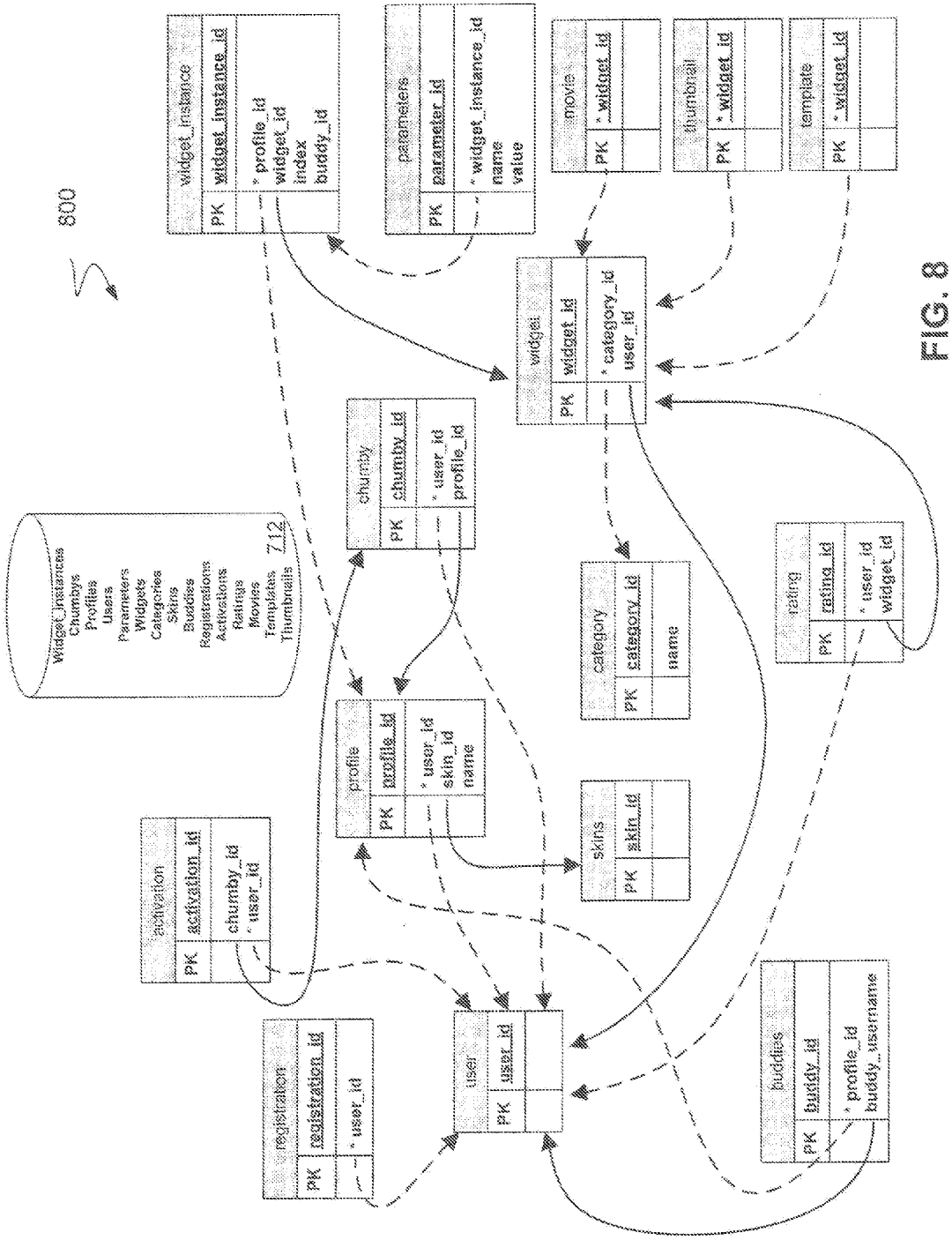

800
Widget_Instances
Chumbys
Profiles
Users
Parameters
Widgets
Categories
Skins
Buddies
Registrations
Activations
Ratings
Movies
Templates
Thumbnails
712
widget_instance
widget_instance_id
PK
* profile_id
widget_id
index
buddy_id
parameters
parameter_id
PK
* widget_instance_id
name
value
movie
* widget_id
PK
thumbnail
* widget_id
PK
template
* widget_id
PK
widget
widget_id
PK
* category_id
user_id
chumby
chumby_id
PK
* user_id
profile_id
category
category_id
PK
name
rating
rating_id
PK
* user_id
widget_id
profile
profile_id
PK
* user_id
skin_id
name
skins
skin_id
PK
activation
activation_id
PK
chumby_id
* user_id
registration
registration_id
PK
* user_id
user
user_id
PK
buddies
buddy_id
PK
* profile_id
buddy_username

FIG. 8

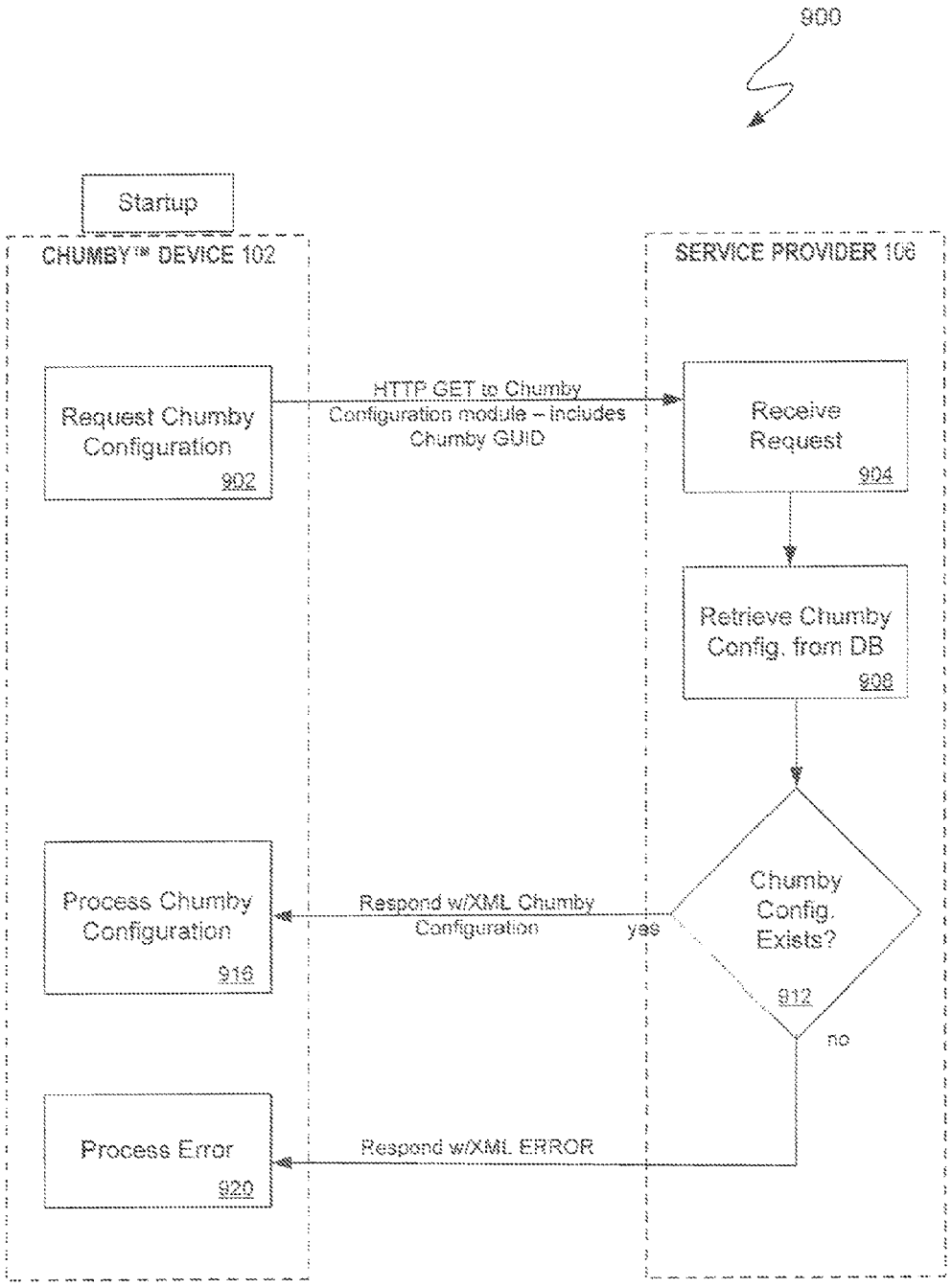

900
Startup
CHUMBY™ DEVICE 102
SERVICE PROVIDER 106
Request Chumby Configuration
902
HTTP GET to Chumby Configuration module – includes Chumby GUID
Receive Request
904
Retrieve Chumby Config. from DB
908
Chumby Config. Exists?
912
yes
no
Respond w/XML Chumby Configuration
Process Chumby Configuration
918
Respond w/XML ERROR
Process Error
920

FIG. 9

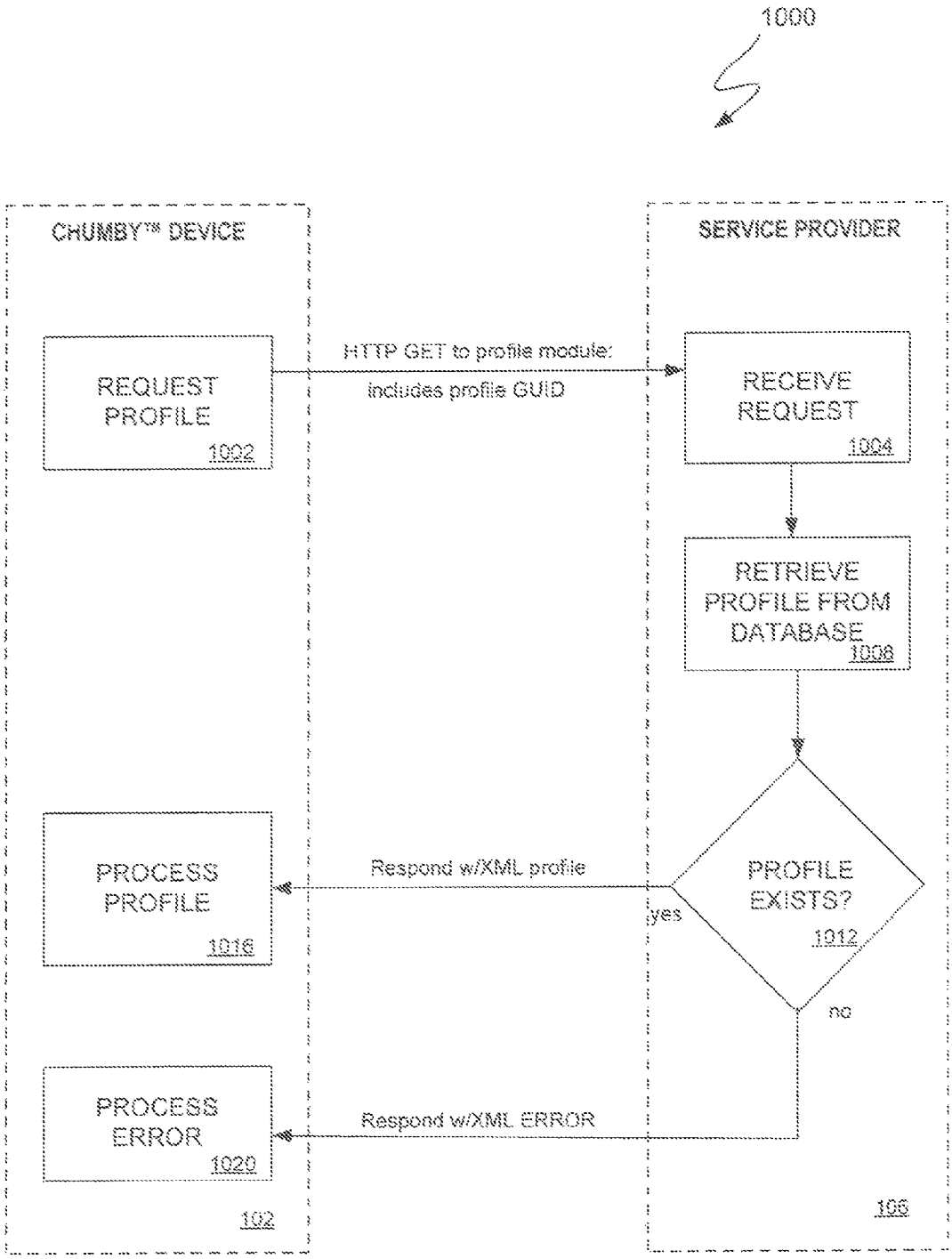

1000
CHUMBY™ DEVICE
SERVICE PROVIDER
REQUEST PROFILE
1002
HTTP GET to profile module:
includes profile GUID
RECEIVE REQUEST
1004
RETRIEVE PROFILE FROM DATABASE
1008
PROFILE EXISTS?
1012
yes
no
Respond w/XML profile
PROCESS PROFILE
1016
Respond w/XML ERROR
PROCESS ERROR
1020
102
106

FIG. 10

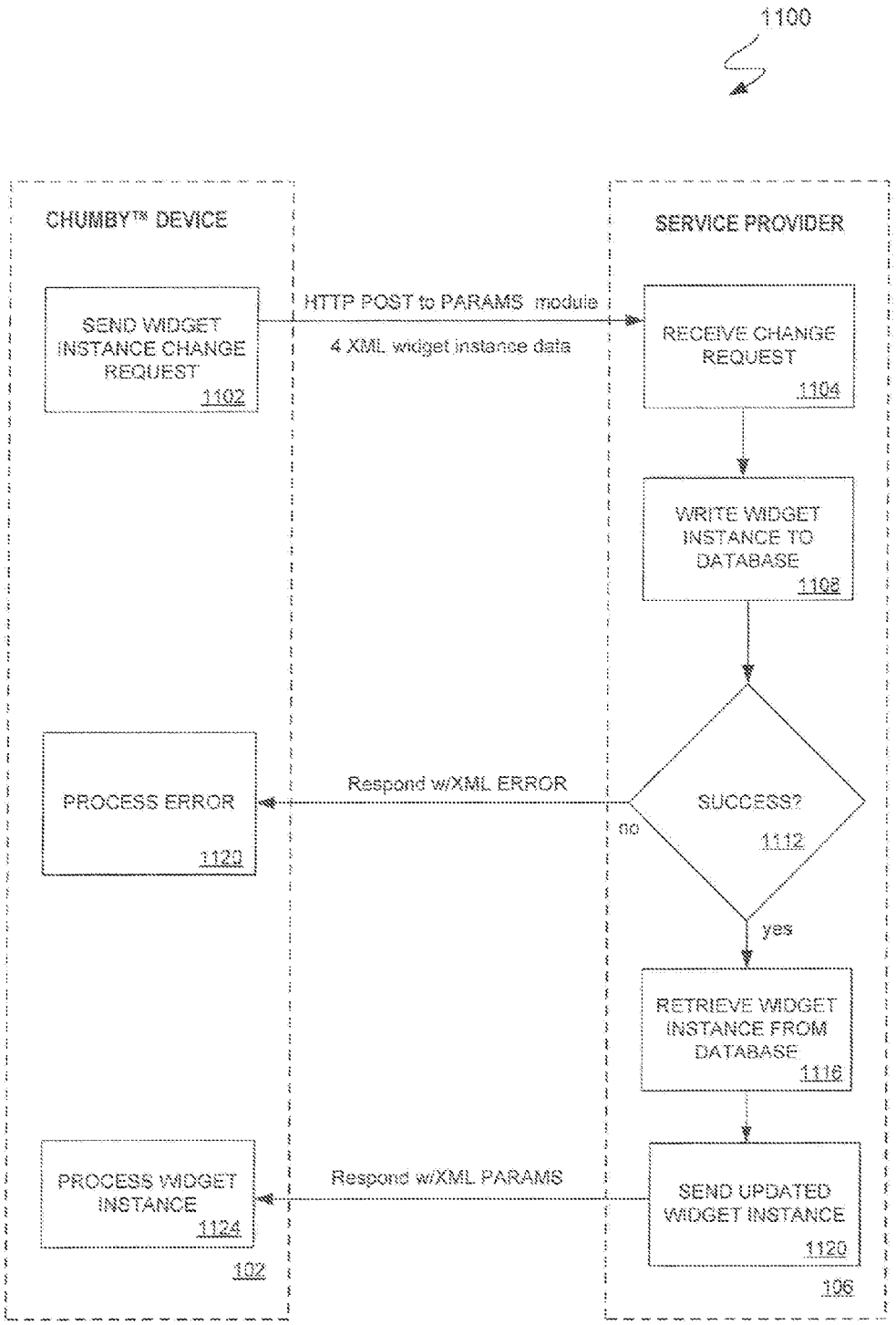

1100
CHUMBY™ DEVICE
SERVICE PROVIDER
SEND WIDGET INSTANCE CHANGE REQUEST
1102
HTTP POST to PARAMS module
& XML widget instance data
RECEIVE CHANGE REQUEST
1104
WRITE WIDGET INSTANCE TO DATABASE
1108
SUCCESS?
1112
no
Respond w/XML ERROR
PROCESS ERROR
1120
yes
RETRIEVE WIDGET INSTANCE FROM DATABASE
1116
SEND UPDATED WIDGET INSTANCE
1120
Respond w/XML PARAMS
PROCESS WIDGET INSTANCE
1124
102
106

FIG. 11

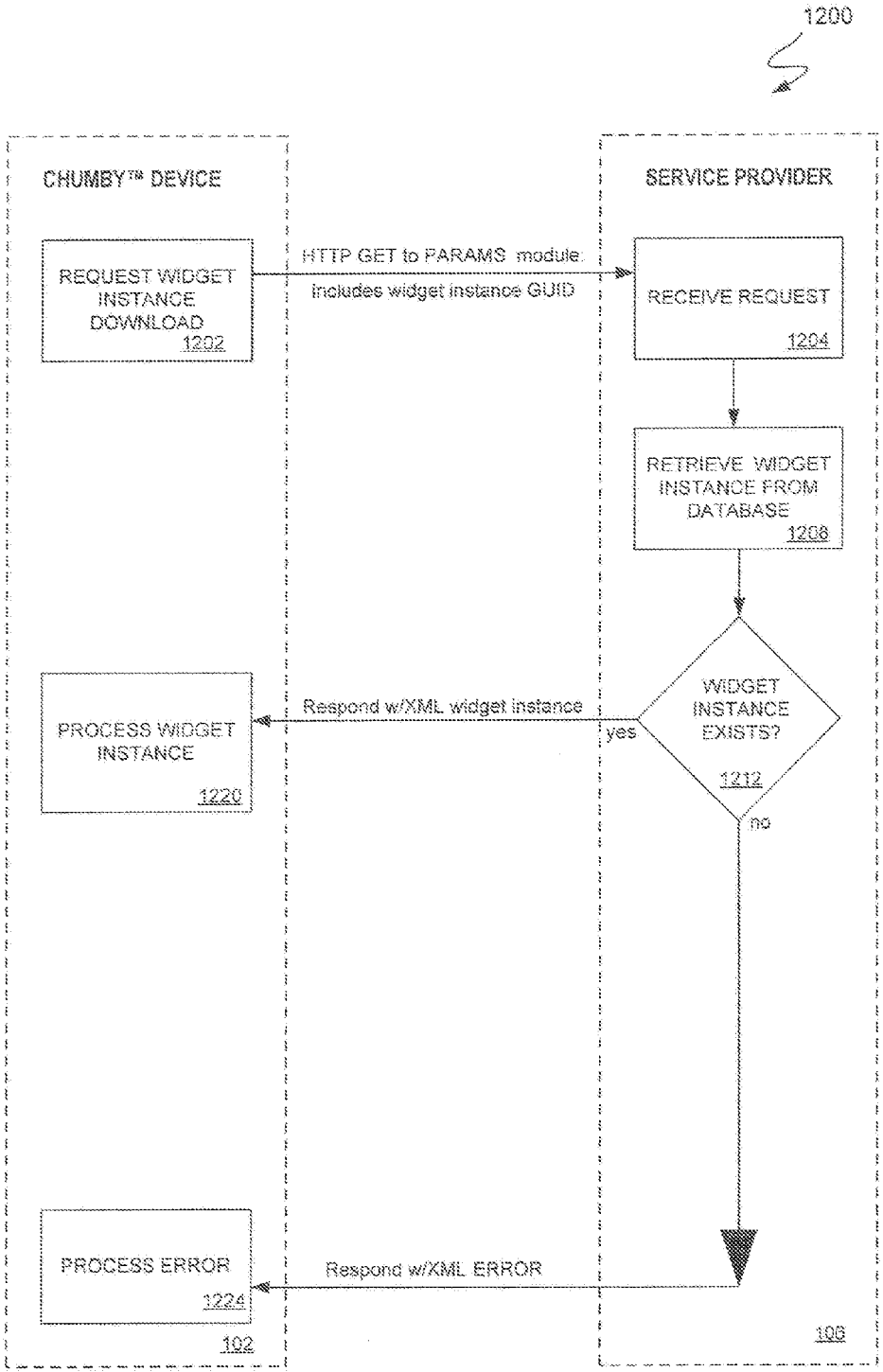

1200
CHUMBY™ DEVICE
SERVICE PROVIDER
REQUEST WIDGET INSTANCE DOWNLOAD
1202
HTTP GET to PARAMS module
Includes widget instance GUID
RECEIVE REQUEST
1204
RETRIEVE WIDGET INSTANCE FROM DATABASE
1208
WIDGET INSTANCE EXISTS?
1212
yes
no
Respond w/XML widget instance
PROCESS WIDGET INSTANCE
1220
Respond w/XML ERROR
PROCESS ERROR
1224
102
106

FIG. 12

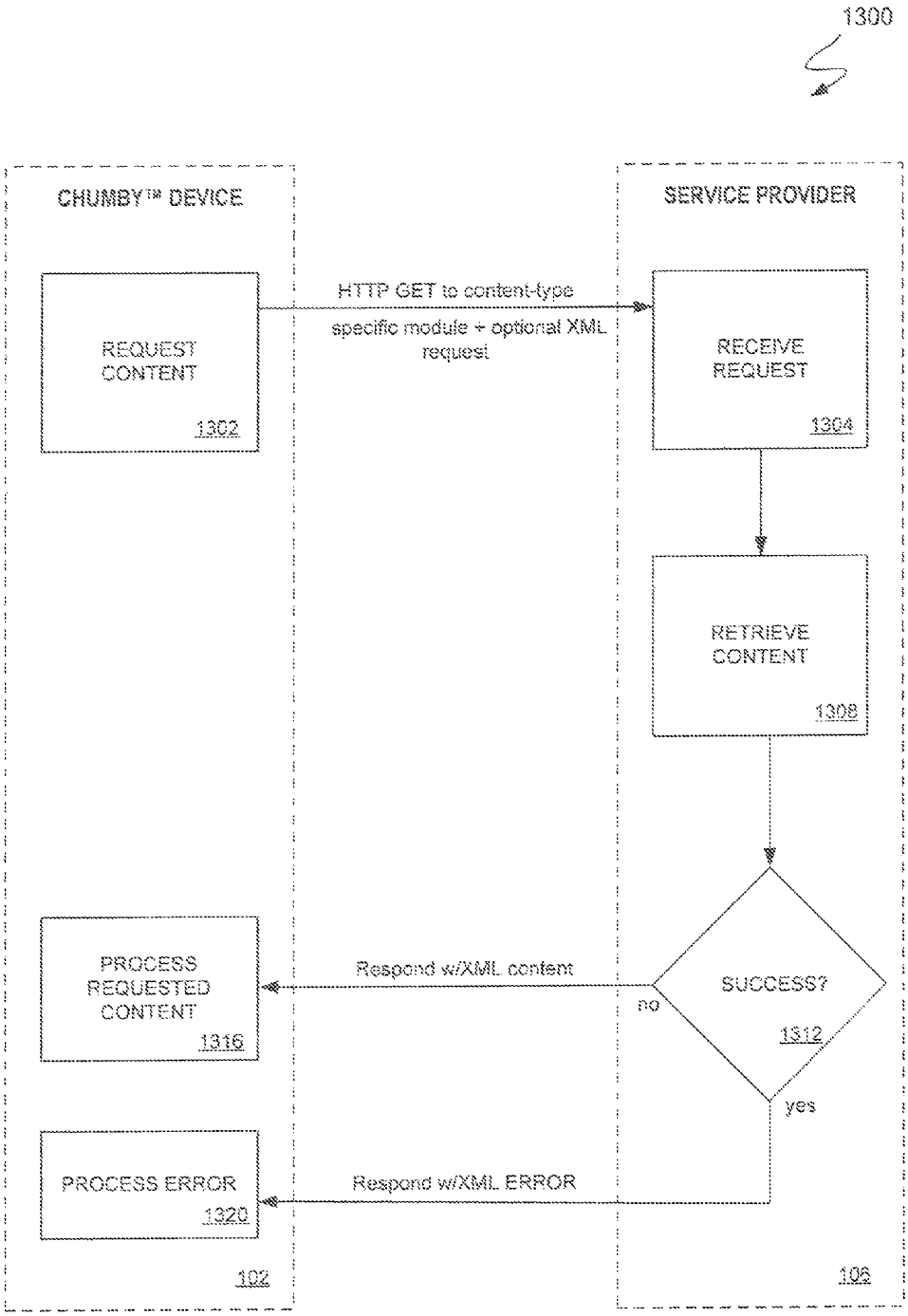

1300
CHUMBY™ DEVICE
SERVICE PROVIDER
REQUEST CONTENT
1302
HTTP GET to content-type specific module + optional XML request
RECEIVE REQUEST
1304
RETRIEVE CONTENT
1308
SUCCESS?
1312
no
yes
Respond w/XML content
PROCESS REQUESTED CONTENT
1316
Respond w/XML ERROR
PROCESS ERROR
1320
102
106

FIG. 13

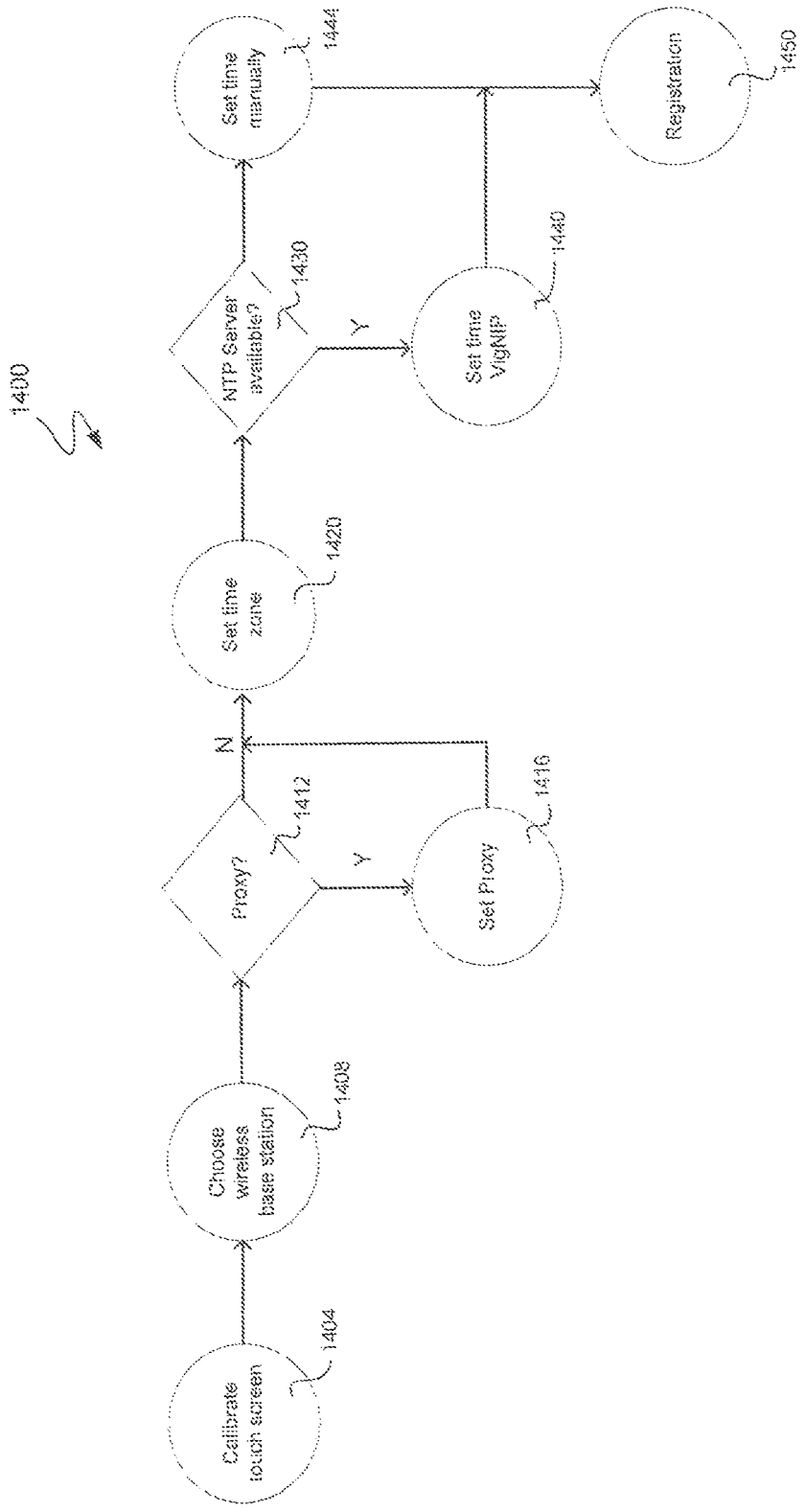

1400
Calibrate touch screen
1404
Choose wireless base station
1408
Proxy?
1412
Y
Set Proxy
1416
N
Set time zone
1420
NTP Server available?
1430
Y
Set time VigNP
1440
Set time manually
1444
Registration
1450

FIG. 14

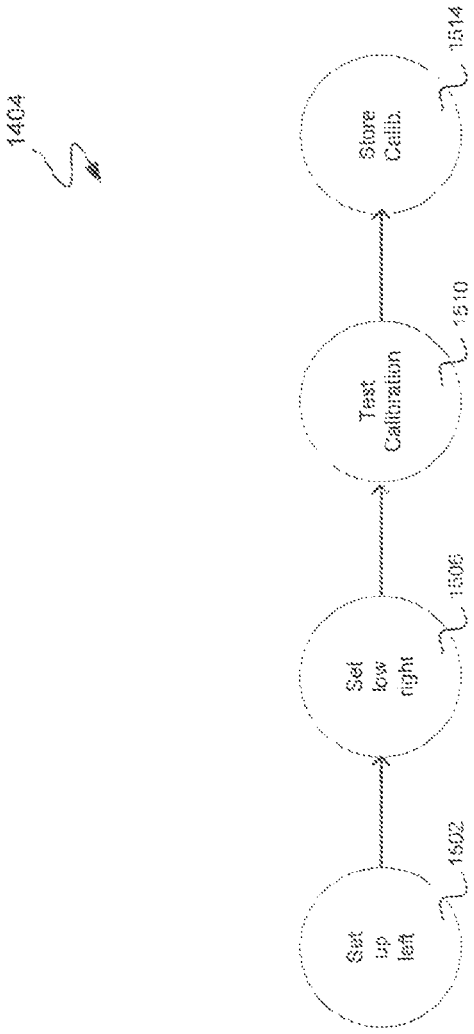

1404
Set up left
1502
Set low right
1506
Test Calibration
1510
Store Calib.
1514

FIG. 15

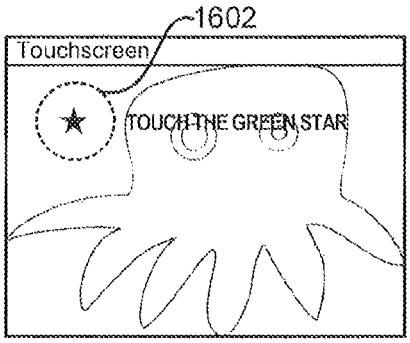


FIG. 16A

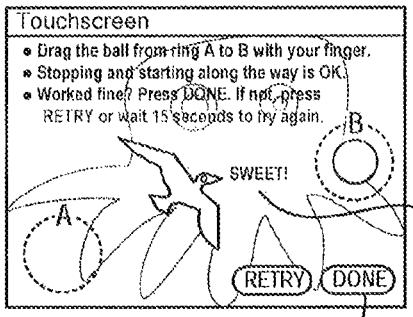


FIG. 16D

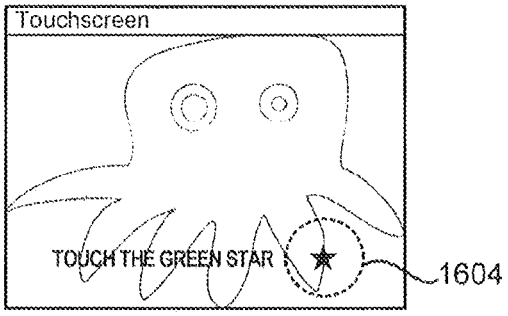


FIG. 16B

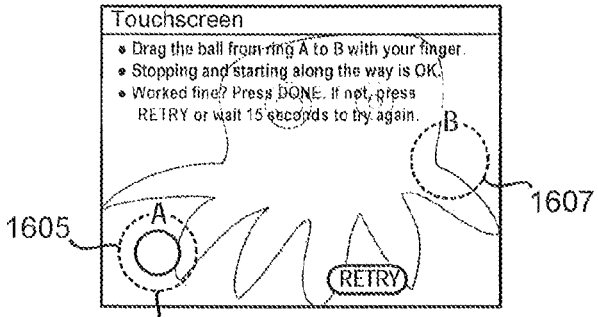


FIG. 16C

FIG. 16

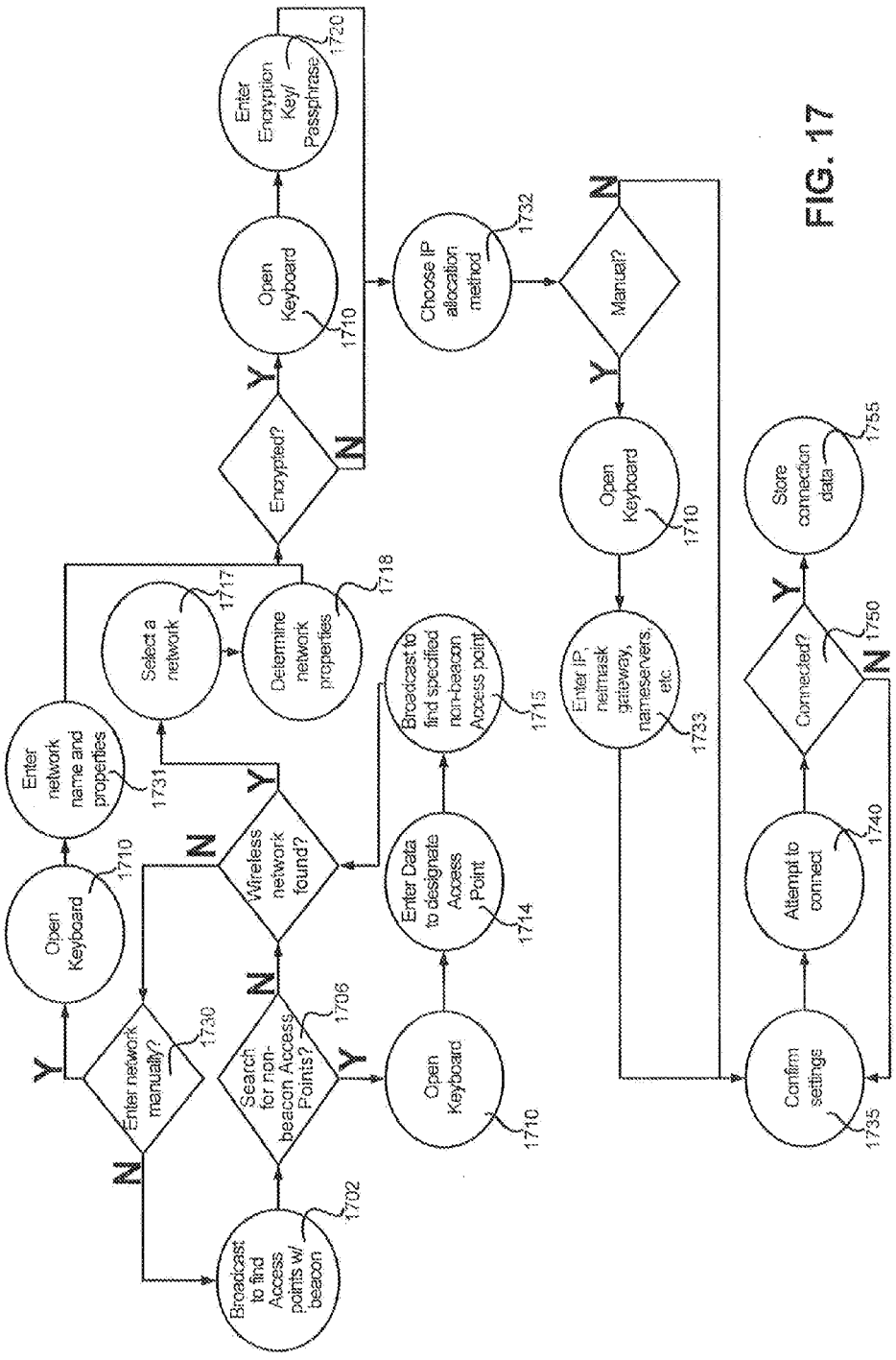

Broadcast to find Access points w/ beacon
1702
Search for non-beacon Access Points?
1706
Y
N
Enter network manually?
1730
Y
N
Open Keyboard
1710
Enter network name and properties
1731
Wireless network found?
Y
N
Open Keyboard
1710
Enter Data to designate Access Point
1714
Broadcast to find specified non-beacon Access point
1715
Select a network
1717
Determine network properties
1718
Encrypted?
Y
N
Open Keyboard
1710
Enter Encryption Key/ Passphrase
1720
Choose IP allocation method
1732
Manual?
Y
N
Open Keyboard
1710
Enter IP, netmask gateway, nameservers, etc.
1733
Confirm settings
1735
Attempt to connect
1740
Connected?
Y
N
1750
Store connection data
1755

FIG. 17

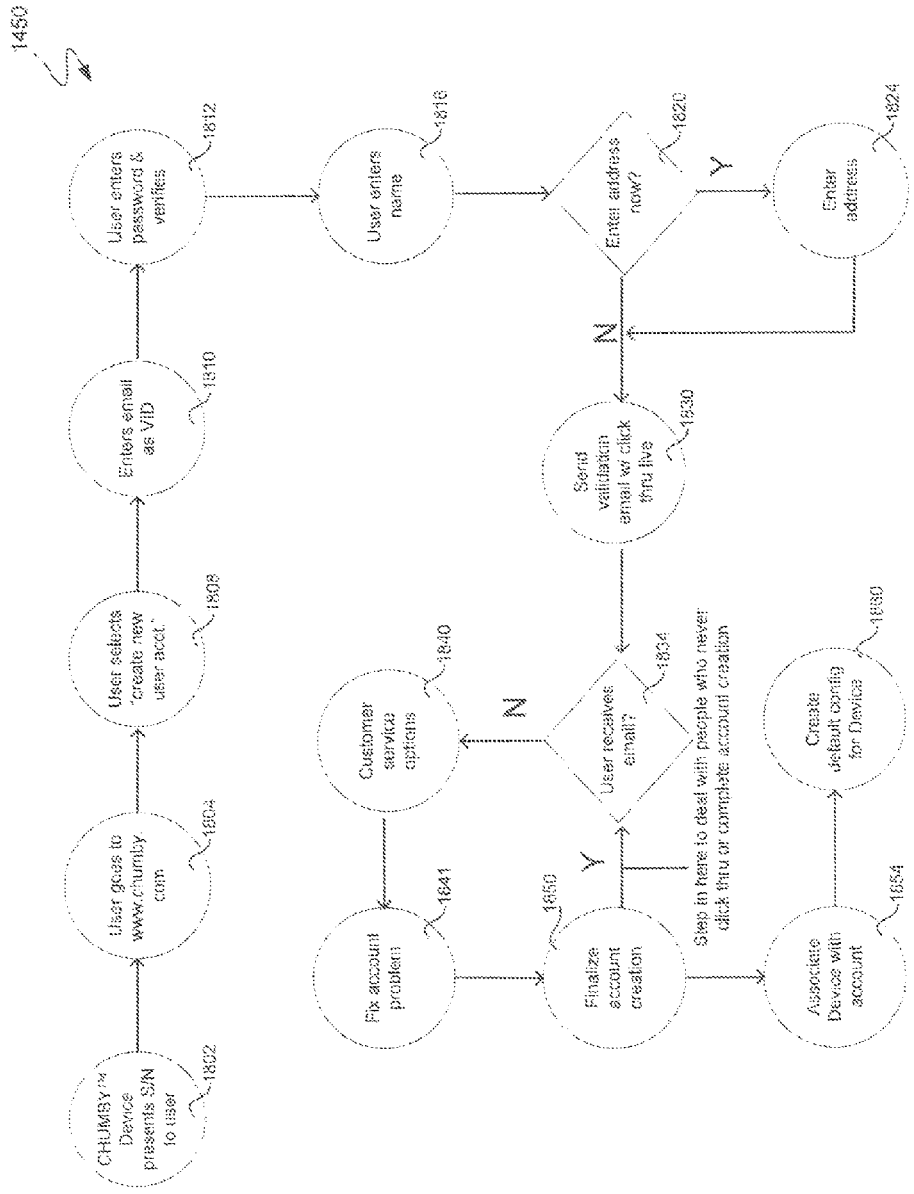

1450
CHUMBY™ Device presents S/N to user
1802
User goes to www.chumby.com
1804
User selects 'create new user acct.'
1808
Enters email as VID
1810
User enters password & verifies
1812
User enters name
1816
Enter address now?
1820
Y
Enter address
1824
N
Send validation email w/ click thru live
1830
User receives email?
1834
Y
Step in here to deal with people who never click thru or complete account creation
N
Customer service options
1840
Fix account problem
1841
Finalize account creation
1850
Associate Device with account
1854
Create default config for Device
1860

FIG. 18

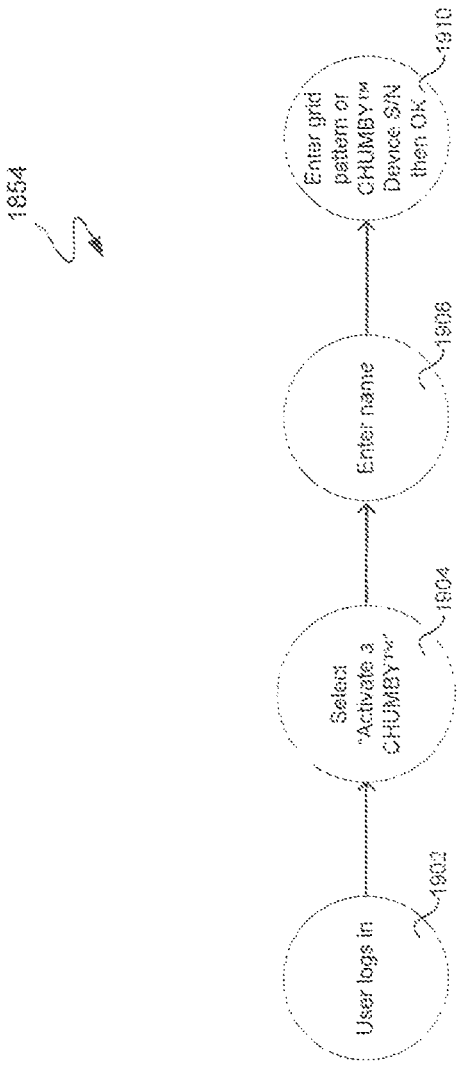

1854
User logs in
1902
Select "Activate a CHUMBY™"
1904
Enter name
1906
Enter grid pattern or CHUMBY™ Device S/N then OK
1910

FIG. 19

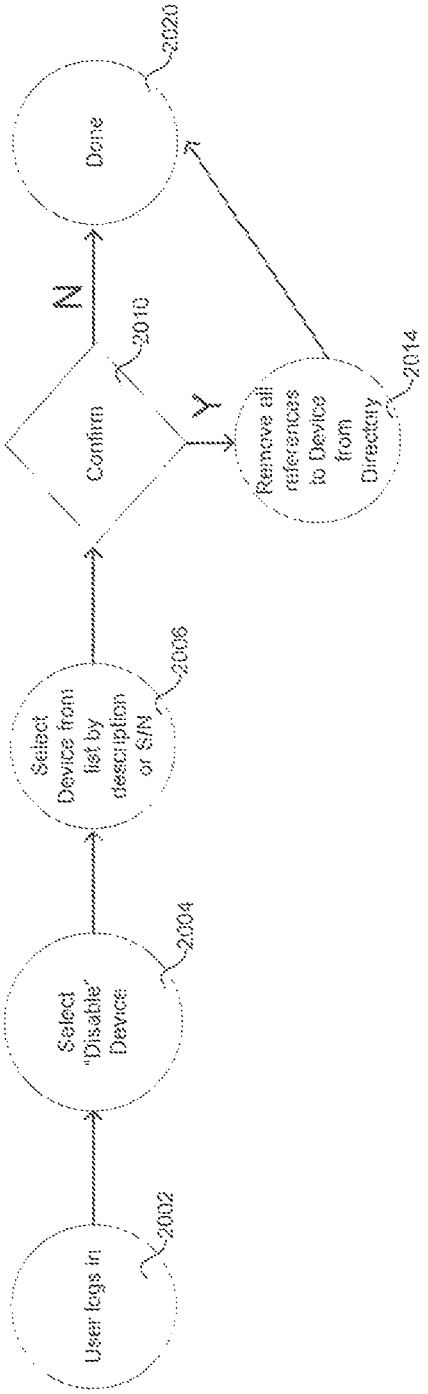

User logs in
2002
Select "Disable" Device
2004
Select Device from list by description or S/N
2006
Confirm
2010
N
Y
Remove all references to Device from Directory
2014
Done
2020

FIG. 20

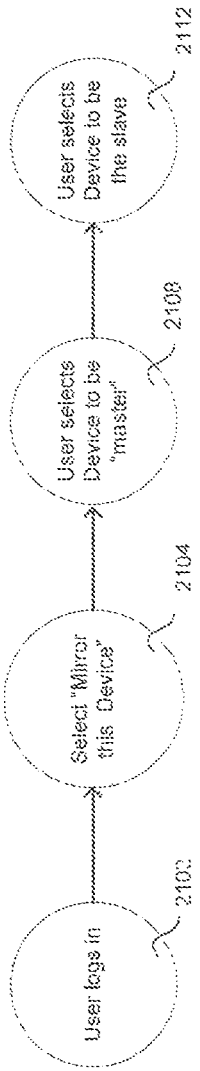

User logs in
2102
Select "Mirror this Device"
2104
User selects Device to be "master"
2108
User selects Device to be the slave
2112

FIG. 21

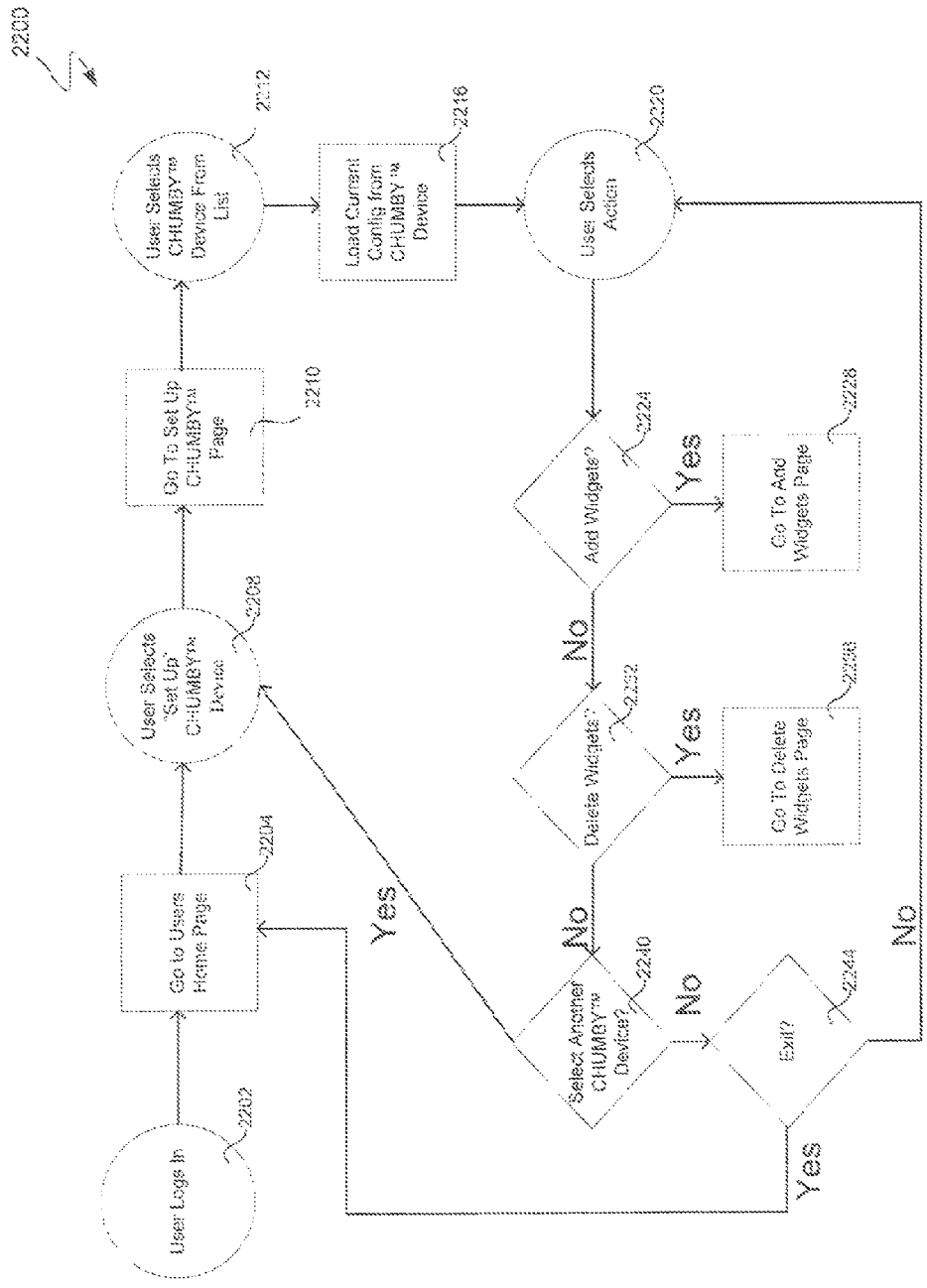

2200
User Logs In
2202
Go to Users Home Page
2204
User Selects 'Set Up' CHUMBY™ Device
2208
Go To Set Up CHUMBY™ Page
2210
User Selects CHUMBY™ Device From List
2212
Load Current Config from CHUMBY™ Device
2216
User Selects Action
2220
Add Widgets?
2224
Yes
Go To Add Widgets Page
2228
No
Delete Widgets?
2232
Yes
Go To Delete Widgets Page
2238
No
Select Another CHUMBY™ Device?
2240
No
Exit?
2244
Yes
Yes
No

FIG. 22

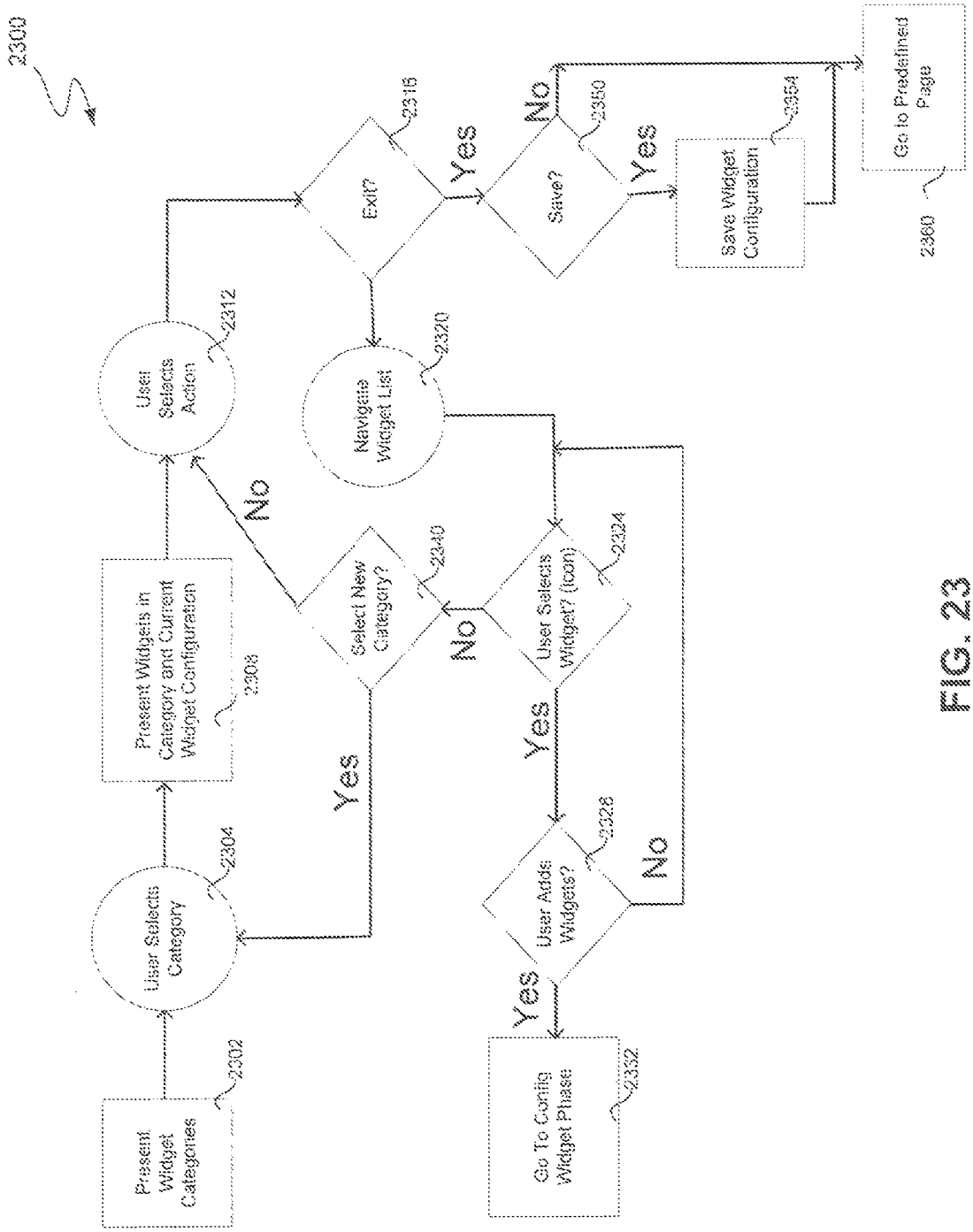

2300
Present Widget Categories
2302
User Selects Category
2304
Present Widgets in Category and Current Widget Configuration
2308
User Selects Action
2312
Exit?
2316
Yes
No
Select New Category?
2240
Yes
No
Navigate Widget List
2320
User Selects Widget? (Icon)
2324
Yes
No
User Adds Widgets?
2328
Yes
No
Go To Config Widget Phase
2332
Save?
2350
Yes
No
Save Widget Configuration
2354
Go to Predefined Page
2360

FIG. 23

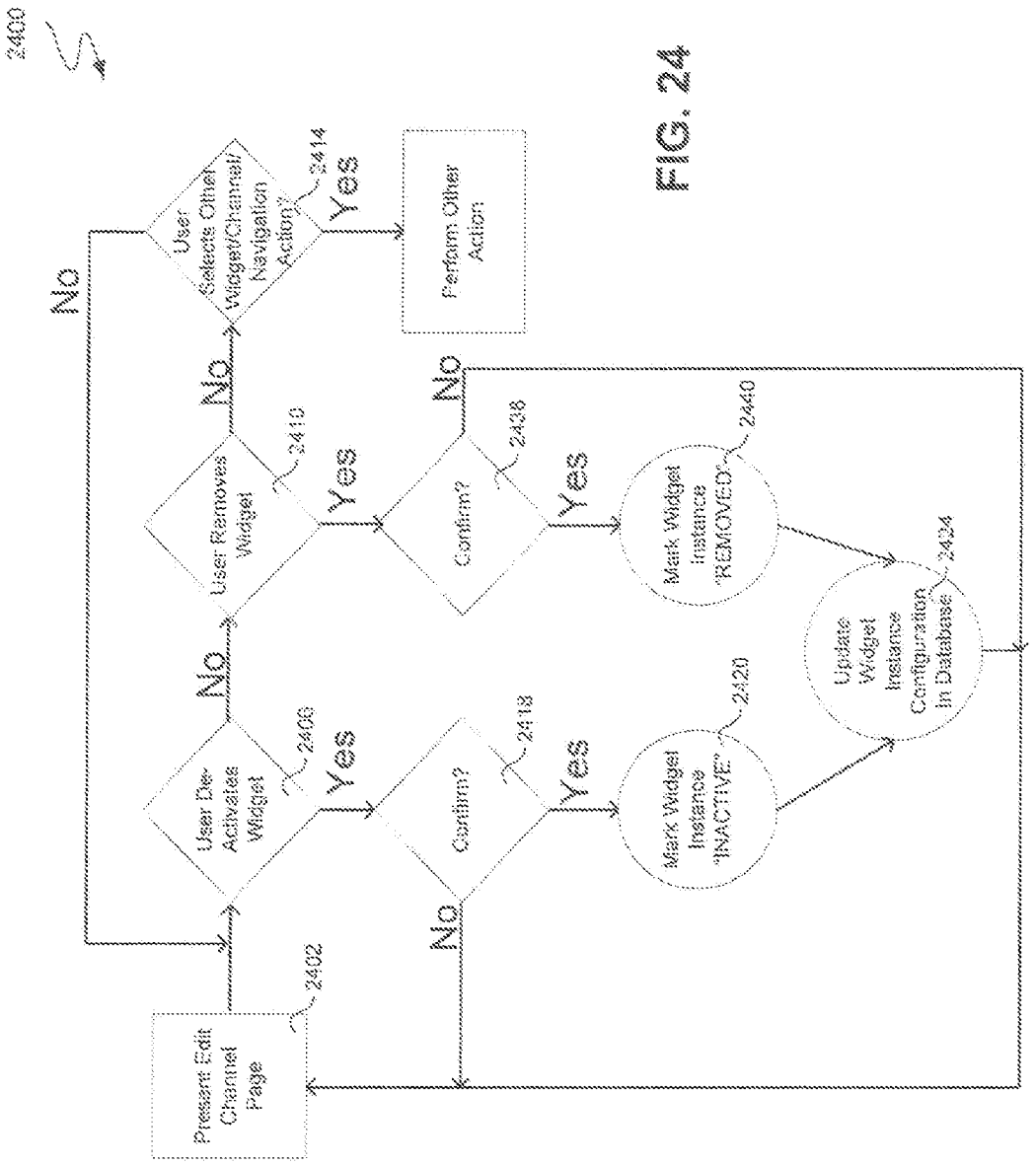

2400
Present Edit Channel Page
2402
User Dev Activates Widget
2406
Yes
No
Confirm?
2418
Yes
No
Mark Widget Instance "INACTIVE"
2420
User Removes Widget
2410
Yes
No
Confirm?
2438
Yes
No
Mark Widget Instance "REMOVED"
2440
Update Widget Instance Configuration In Database
2424
User Selects Other Widget/Channel/ Navigation Action?
2414
Yes
No
Perform Other Action

FIG. 24

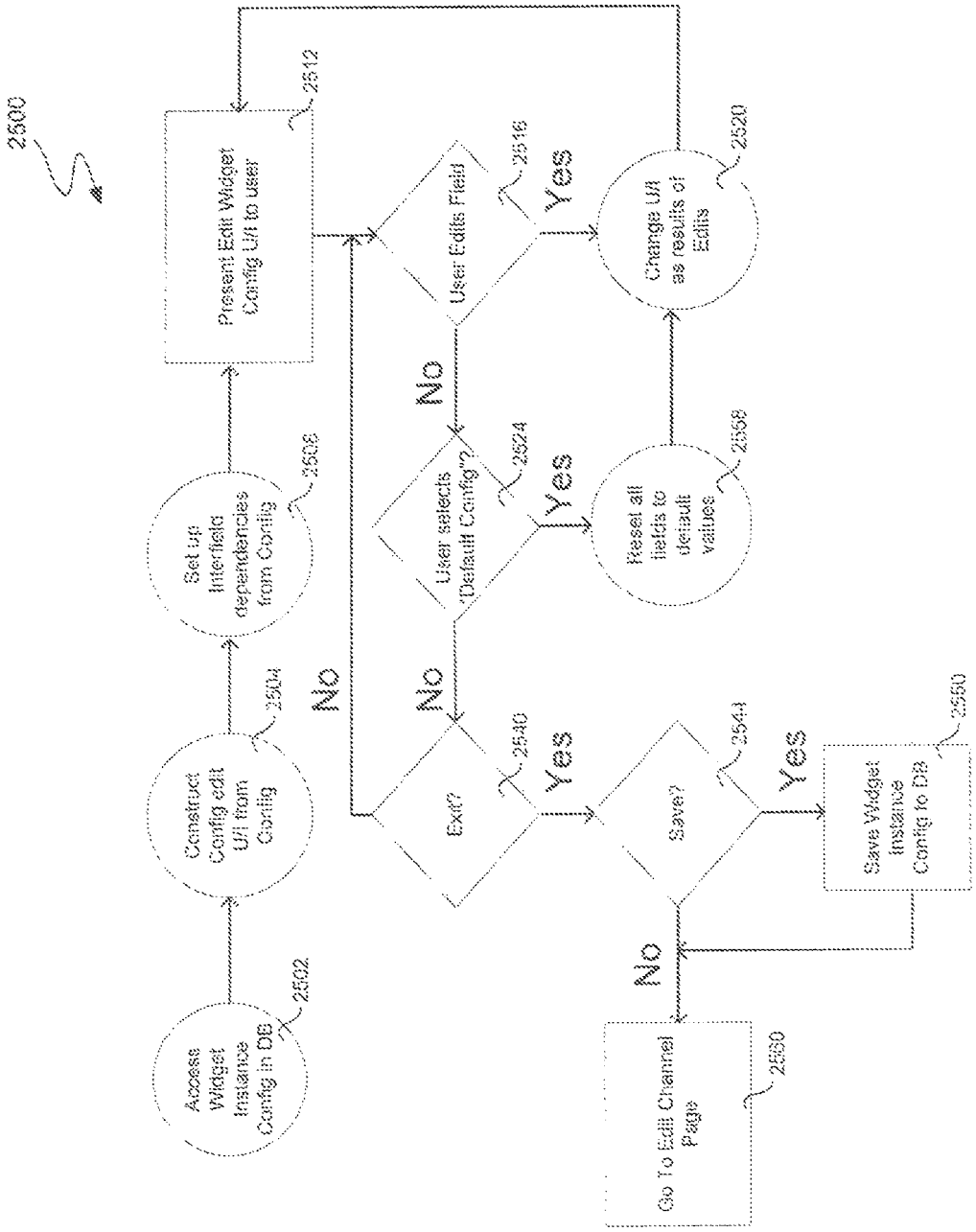

2500
Access Widget Instance Config in DB
2502
Construct Config edit UI from Config
2504
Set up Interfield dependencies from Config
2508
Present Edit Widget Config UI to user
2512
User Edits Field
2516
Yes
Change UI as results of Edits
2520
No
User selects "Default Config"?
2524
Yes
Reset all fields to default values
2528
No
Exit?
2540
Yes
Save?
2544
Yes
Save Widget Instance Config to DB
2550
No
Go To Edit Channel Page
2530

FIG. 25

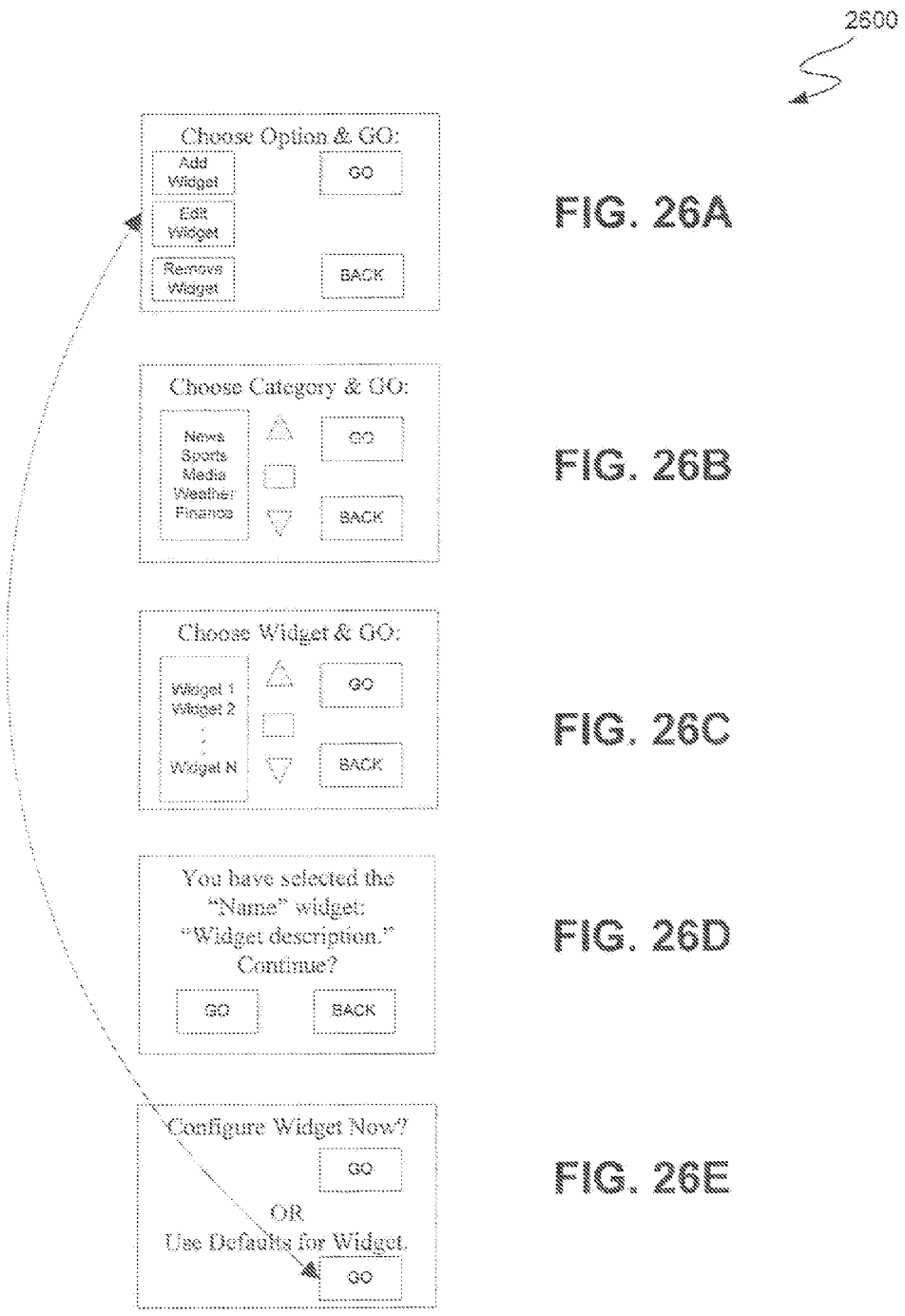


FIG. 26A

FIG. 26B

FIG. 26C

FIG. 26D

FIG. 26E

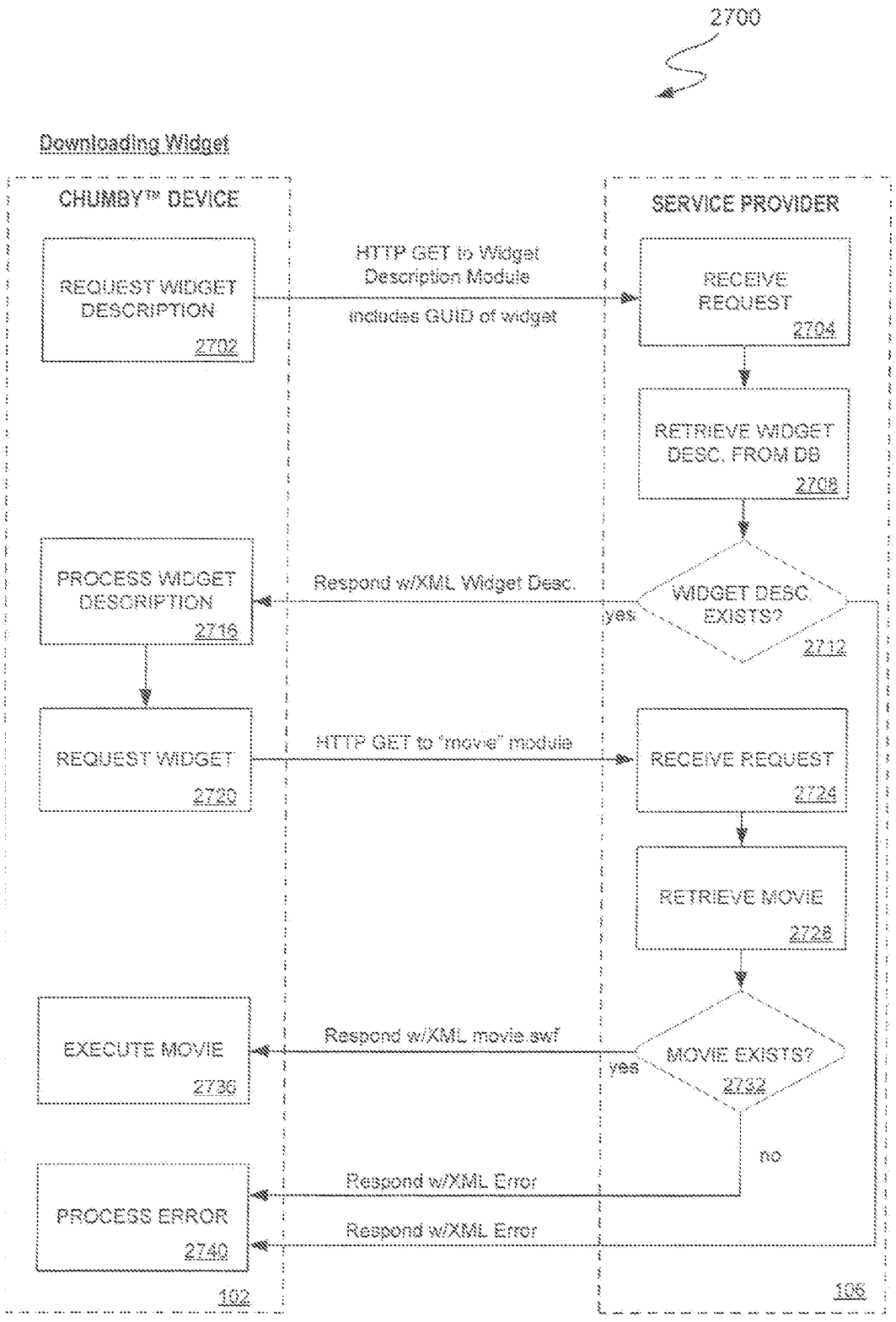

2700
Downloading Widget
CHUMBY™ DEVICE
SERVICE PROVIDER
REQUEST WIDGET DESCRIPTION
2702
HTTP GET to Widget Description Module
includes GUID of widget
RECEIVE REQUEST
2704
RETRIEVE WIDGET DESC. FROM DB
2708
WIDGET DESC. EXISTS?
2712
yes
Respond w/XML Widget Desc.
PROCESS WIDGET DESCRIPTION
2716
REQUEST WIDGET
2720
HTTP GET to "movie" module
RECEIVE REQUEST
2724
RETRIEVE MOVIE
2728
MOVIE EXISTS?
2732
yes
no
Respond w/XML movie.swf
EXECUTE MOVIE
2736
Respond w/XML Error
Respond w/XML Error
PROCESS ERROR
2740
102
106

FIG. 27

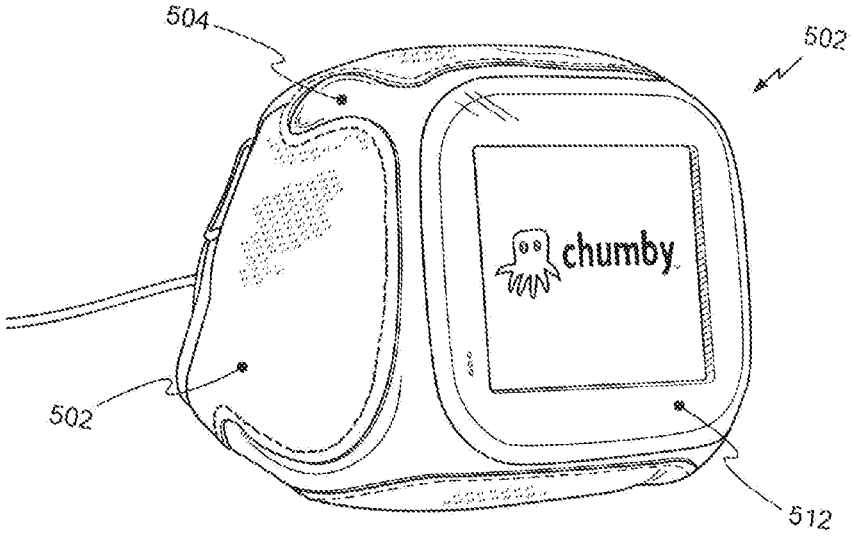


FIG. 28

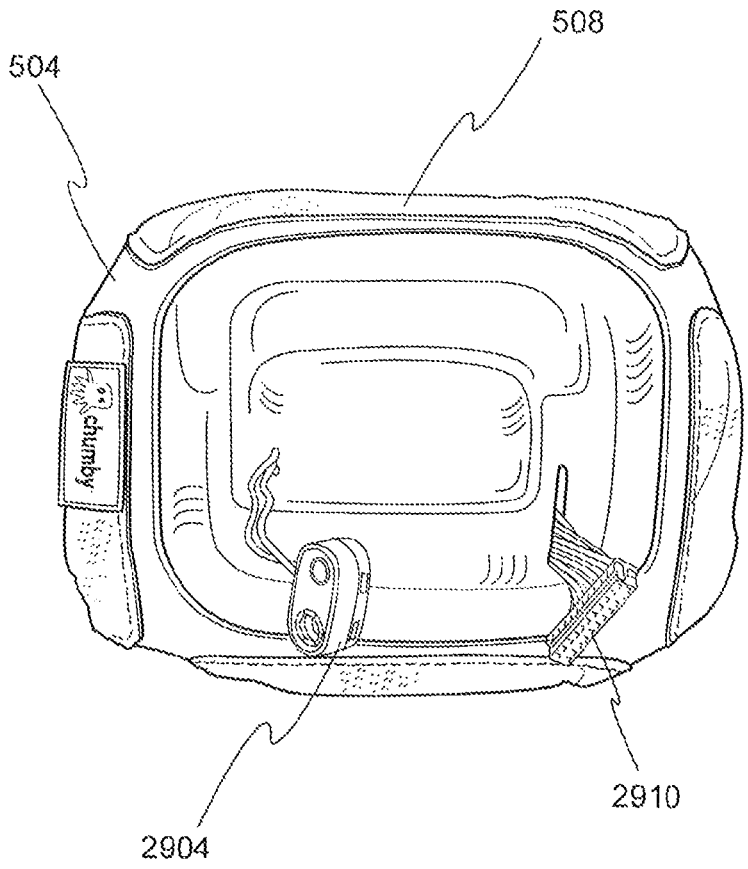


FIG. 29

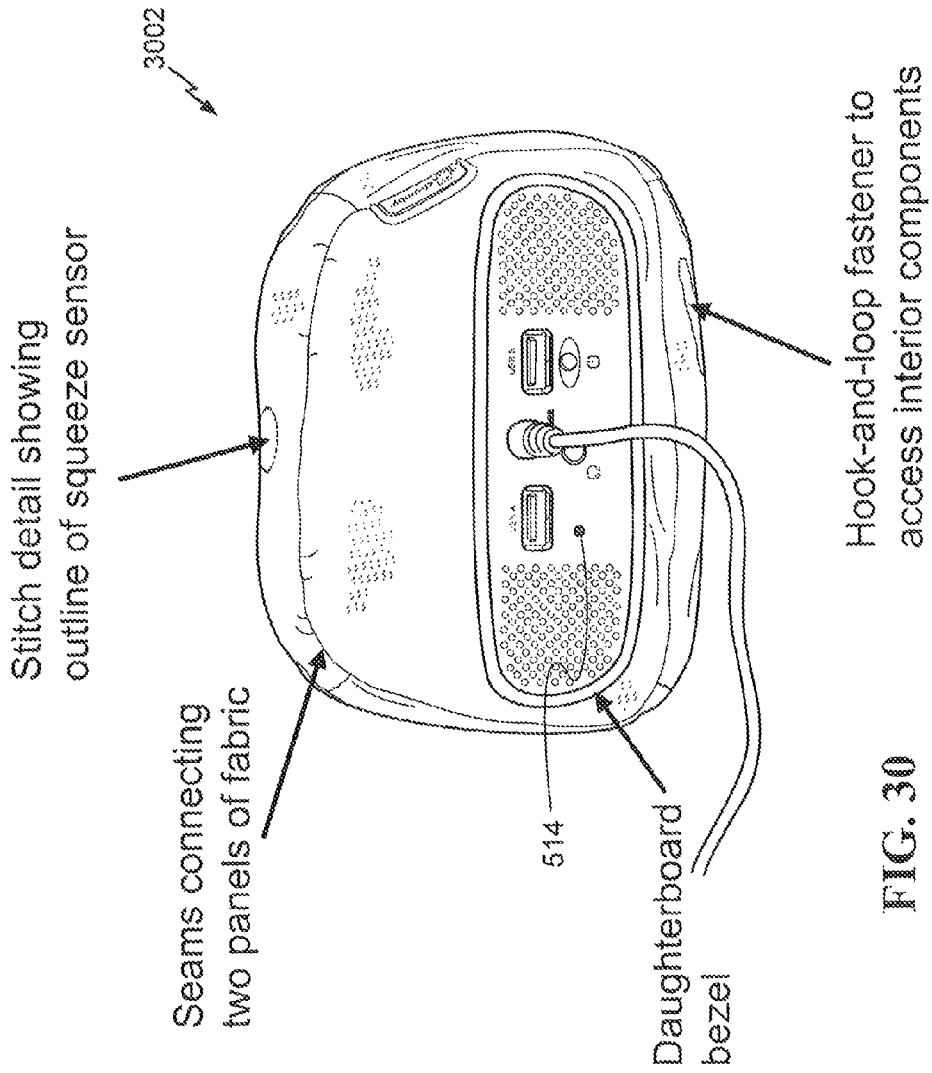

3002
Stitch detail showing outline of squeeze sensor
Seams connecting two panels of fabric
514
Daughterboard bezel
Hook-and-loop fastener to access interior components

FIG. 30

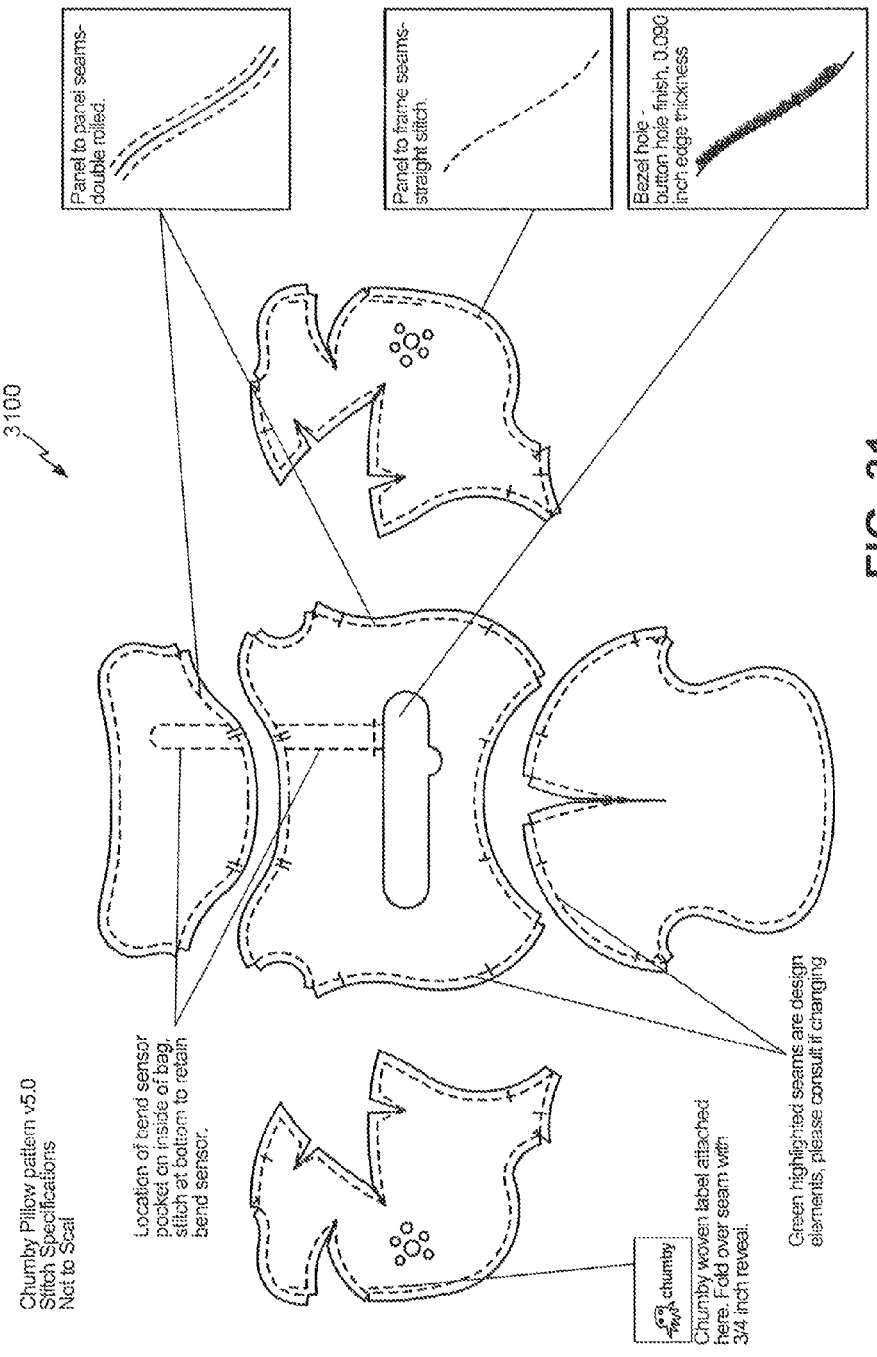

3100
Panel to panel seams-double rolled.
Panel to frame seams-straight stitch.
Bezel hole - button hole finish, 0.090 inch edge thickness
Chumby Pillow pattern v5.0
Stitch Specifications
Not to Scal
Location of bend sensor pocket on inside of bag, stitch at bottom to retain bend sensor.
Chumby woven label attached here. Fold over seam with 3/4 inch reveal.
Green highlighted seams are design elements, please consult if changing

FIG. 31

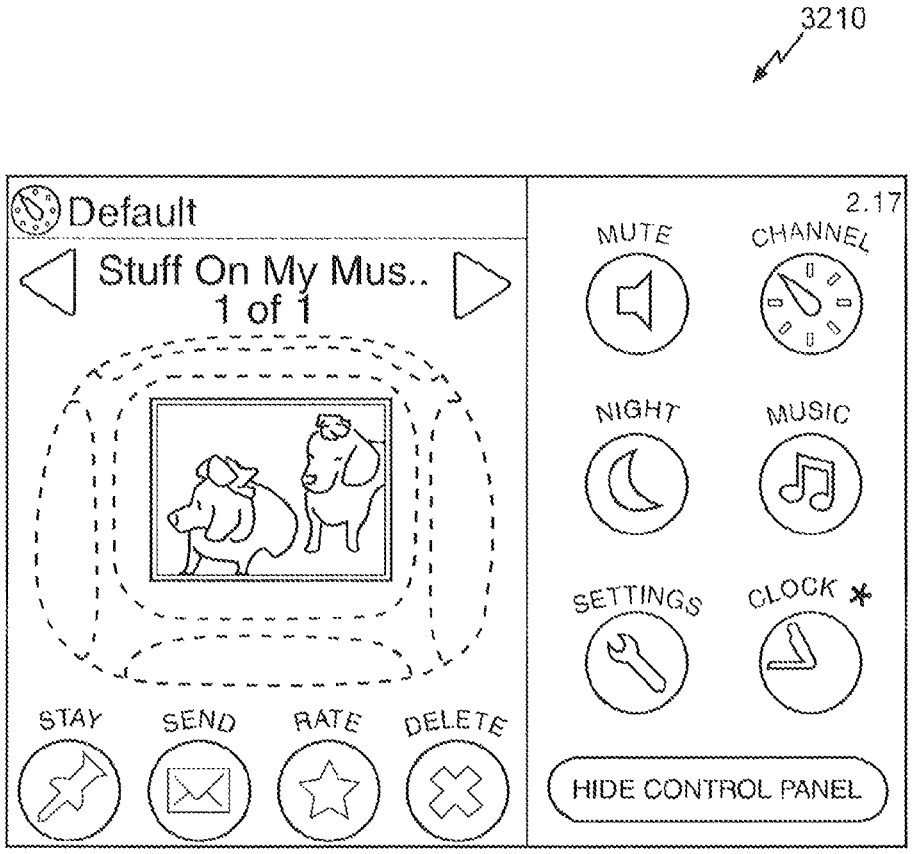

3210
Default
Stuff On My Mus..
1 of 1
2.17
MUTE
CHANNEL
NIGHT
MUSIC
SETTINGS
CLOCK
STAY
SEND
RATE
DELETE
HIDE CONTROL PANEL

FIG. 32

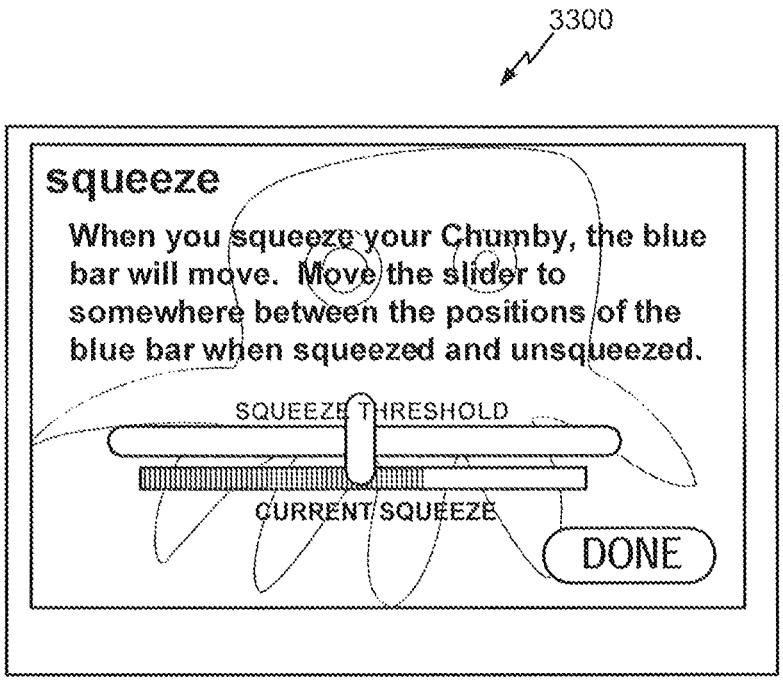

3300
squeeze
When you squeeze your Chumby, the blue bar will move. Move the slider to somewhere between the positions of the blue bar when squeezed and unsqueezed.
SQUEEZE THRESHOLD
CURRENT SQUEEZE
DONE

FIG. 33

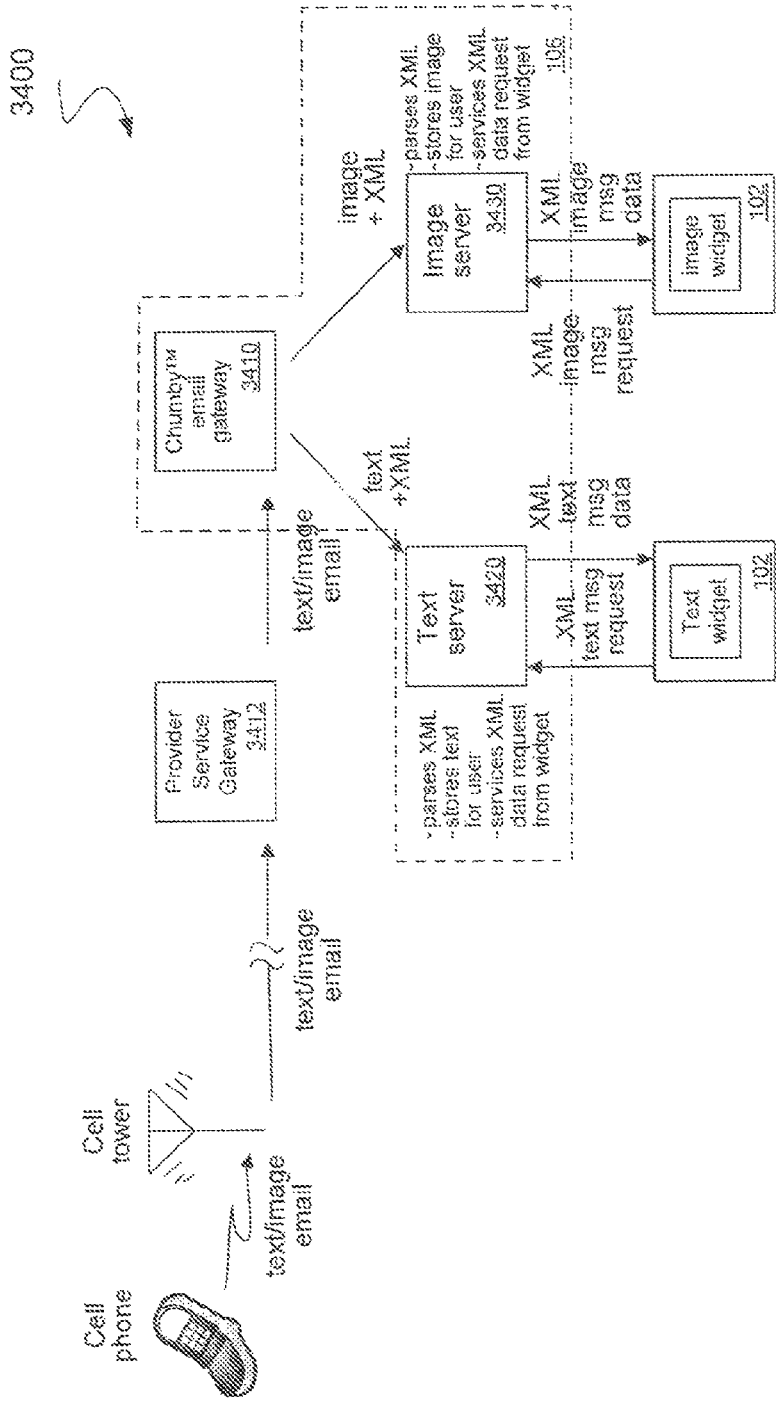

3400
Cell phone
text/image email
Cell tower
text/image email
Provider Service Gateway 3412
Chumby™ email gateway 3410
text/image email
text +XML
image +XML
Text server 3420
-parses XML
-stores text for user
-services XML data request from widget
XML text msg request
XML text msg data
Text widget 102
Image server 3430
-parses XML
-stores image for user
-services XML data request from widget 106
XML image msg request
XML image msg data
image widget 102

FIG. 34

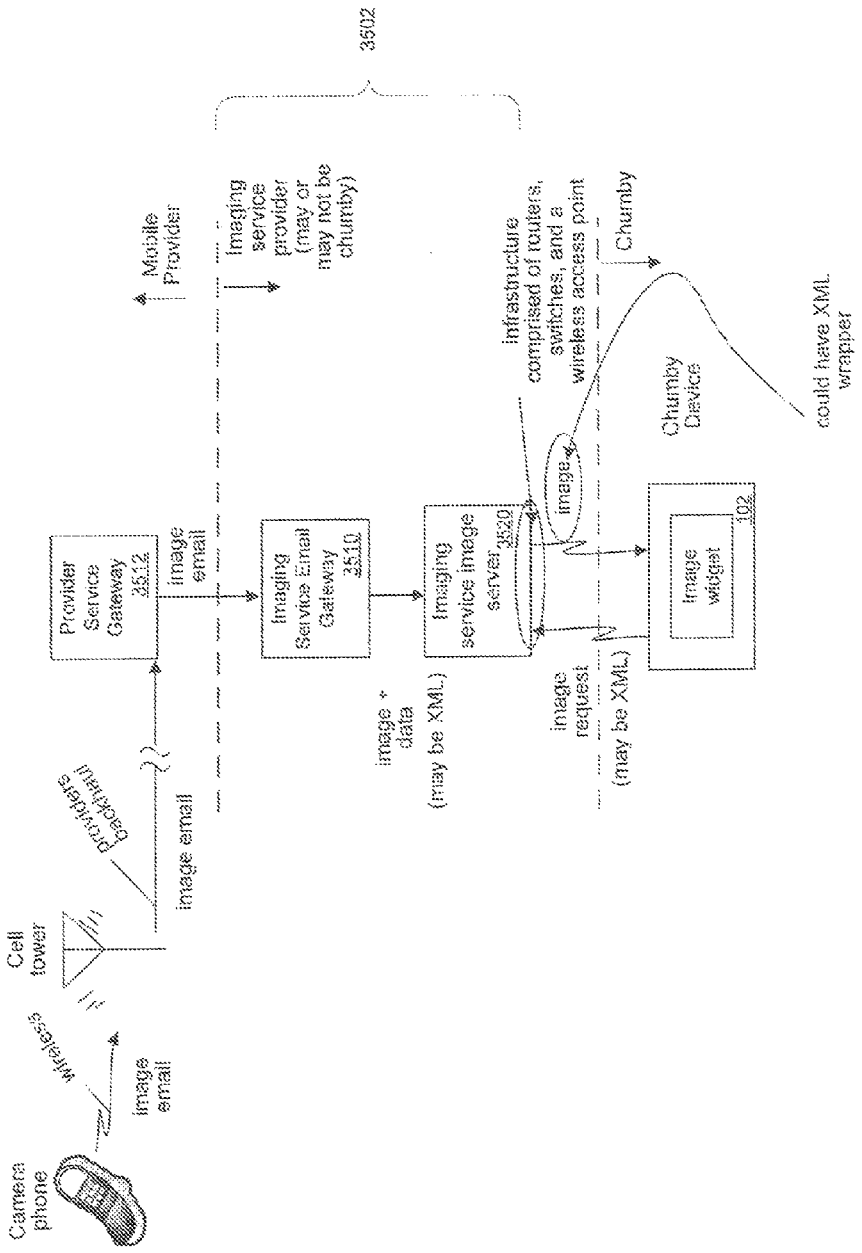

3502
Camera phone
wireless
image email
Cell tower
providers backhaul
image email
Provider Service Gateway 3512
image email
Mobile Provider
Imaging service provider (may or may not be chumby)
Imaging Service Email Gateway 3510
image + data (may be XML)
Imaging service image server 3520
image
infrastructure comprised of routers, switches, and a wireless access point
Chumby
Chumby Device
could have XML wrapper
image request (may be XML)
Image widget 102

FIG. 35

Chumby Network Schema:

User:

Field	Type	Null	Key	Default	Extra	
id	char(36)	NO	PRI			unique GUID for this user
parent_id	varchar(36)	YES		NULL		GUID of "parent" account
username	varchar(36)	NO	UNI			unique username of the user
password	varchar(32)	NO				secret password for the user
account_type	varchar(20)	NO		regular		regular, employee, admin, etc
account_status	varchar(20)	NO		normal		normal, banned, etc
pin	varchar(10)	YES		NULL		security code used for secure transactions
created_at	datetime	YES		NULL		when the user record was created
updated_at	datetime	YES		NULL		when the user record was last modified
expires_at	datetime	YES		NULL		if subscription, when it expires
name_first	varchar(32)	YES		NULL		user's first name
name_last	varchar(32)	YES		NULL		user's surname
language_code	varchar(5)	NO		en-US		native language of the user
email	varchar(100)	YES		NULL		validated email address of the user
developer	tinyint(1)	YES		0		true if user has accepted the developer EULA
eula	tinyint(1)	YES		0		true if the user has accepted the terms of service
birthdate	date	YES		NULL		match date of the user
opt_in	tinyint(1)	YES		0		whether the user has opted in to email
secret_question	varchar(255)	YES		NULL		question the user must answer to retrieve password
secret_answer	varchar(255)	YES		NULL		the answer to the question
address_guid	varchar(36)	YES		NULL		unique GUID for the user's address
street1	varchar(32)	YES		NULL		user address street address, line 1
street2	varchar(32)	YES		NULL		user address street address, line 2
city	varchar(32)	YES		NULL		user city
state	varchar(32)	YES		NULL		user state/province
country	varchar(32)	YES		NULL		user country
zip	varchar(32)	YES		NULL		user zip/postal code
phone	varchar(32)	YES		NULL		user phone number
unverified	varchar(42)	YES		NULL		code for email verification of the account
education_history	varchar(255)	YES		NULL		education level of the user
gender	varchar(255)	YES		NULL		gender of the user
access_id	varchar(36)	YES		NULL		alternative GUID for this account
buddy_acceptance	varchar(10)	YES		NULL		default acceptance of buddies

FIG. 36A

Profile:

Field	Type	Null	Key	Default	Extra	
id	char(36)	NO	PRI			unique GUID for the profile
user_id	varchar(36)	NO	MUL			GUID of the user that owns this profile
skin_id	varchar(36)	NO	MUL			GUID of the skin this profile uses
name	varchar(32)	NO				name of the profile
access	varchar(10)	NO		private		private , protected (huddies), public
access_id	varchar(36)	YES		NULL		alternative GUID for this profile
email	varchar(100)	YES		NULL		email address for this profile
master	tinyint(1)	YES		0		true if the is the "default" profile for the account
description	text	YES		NULL		a brief description of the profile
created_at	datetime	YES		NULL		when the profile was created
updated_at	datetime	YES		NULL		when the profile was last changed

Chumby:

Field	Type	Null	Key	Default	Extra	
id	char(36)	NO	PRI			unique GUID for this chumby
user_id	varchar(36)	NO	MUL			GUID of the user that owns this chumby
profile_id	varchar(36)	NO	MUL			GUID of the profile this chumby should display
name	varchar(33)	YES		NULL		the name of the this chumby
created_at	datetime	YES		NULL		when the chumby was registered
updated_at	datetime	YES		NULL		when the chumby was last charged
authorized_at	datetime	YES		NULL		when the chumby was last authorized
control_panel	varchar(200)	YES		NULL		the name of the Control Panel it should use

FIG. 36B

Category:

Field	Type	Null	Key	Default	Extra
id	char(36)	NO	PRI			unique GUID for the category
name	varchar(32)	NO	UNI			name of the category
description	text	YES		NULL		description of the category
created_at	datetime	YES		NULL		when the category was created
updated_at	datetime	YES		NULL		when the category was last changed
slug	varchar(255)	YES		NULL		URL-friendly name of the category

Skin:

Field	Type	Null	Key	Default	Extra
id	char(36)	NO	PRI			unique GUID of the skin
name	varchar(32)	NO	UNI			name of the skin
description	text	YES		NULL		description of the skin
created_at	datetime	YES		NULL		when the skin was created
updated_at	datetime	YES		NULL		when the skin was last changed
data	mediumblob	YES		NULL		the data encapsulating the skin

FIG. 36C

Widget:

Field	Type	Null	Key	Default	Extra	
id	char(36)	NO	PRI			unique GUID of this widget
category_id	varchar(36)	NO	MUL			GUID for the category for this widget
user_id	varchar(36)	NO	MUL			GUID for the author/owner of this widget
name	varchar(33)	NO	UNI			name of the widget
description	text	YES		NULL		description of the widget
version	varchar(32)	NO		1.0		version of the widget
protection	varchar(10)	NO		none		encryption used by this widget
access	varchar(10)	NO		public		private, protected (huddles), public
approval_status	varchar(32)	NO		pending		approval status of the widget for public use
fee_model	varchar(32)	NO		free		free, subscription, etc
fee_code	varchar(32)	YES		none		parameter for the fee (weekly, once, etc)
fee_price	varchar(32)	NO		0.00		the fee price
play_mode	varchar(12)	NO		default		default, timeout, cooperative
play_time	int(12)	NO		15		how long the widget should play if timeout
created_at	datetime	YES		NULL		when the widget was created
updated_at	datetime	YES		NULL		when the widget was last changed
make_public	int(1)	NO		0		request by author to make widget public
average_rating	float	NO		0		cached rating of the widget
rating_count	int(11)	NO		0		how many ratings have been submitted
slug	varchar(255)	YES		NULL		URL-friendly name of the widget
sendable	tinyint(1)	YES		1		true if the widget be sent to another user
deleteable	tinyint(1)	YES		1		true if user can delete the widget from the profile
virtualable	tinyint(1)	YES		1		true if the widget supports virtual chumby
allowed_email	int(11)	YES		0		true if the widget is allowed to send email
request_email	int(11)	YES		0		true if the author requests email privileges
enabled	int(11)	YES		1		true if the widget is enabled
access_id	varchar(36)	YES		NULL		alternative GUID for the widget

FIG. 36D

Widget Instance:

Field	Type	Null	Key	Default	Extra	
id	char(36)	NO	PRI			the unique GUID of the widget instance
profile_id	varchar(36)	NO	MUL			the profile owning this widget instance
widget_id	varchar(36)	NO	MUL			the widget this widget instance uses
access	varchar(10)	NO		private		private, protected, public
created_at	datetime	YES		NULL		when the instance was created
updated_at	datetime	YES		NULL		when the instance was last changed
secure	varchar(255)	YES		NULL		a special "secure" parameter string
play_mode	varchar(32)	NO		default		default, timeout, cooperative
play_time	int(11)	NO		15		how long the widget should play
position	int(11)	YES		NULL		index of the instance within the profile
buddy_id	varchar(36)	YES		NULL		who sent the widget
accepted	tinyint(1)	YES		1		true if the widget was accepted by the receiver
forward	tinyint(1)	YES		1		true if the widget can be forwarded to another user

Widget Parameter:

Field	Type	Null	Key	Default	Extra	
id	char(36)	NO	PRI			unique GUID of the parameter
widget_instance_id	varchar(36)	NO	MUL			the GUID of the owning widget instance
name	varchar(32)	NO				the name of the parameter
value	text	YES		NULL		the value of the parameter
created_at	datetime	YES		NULL		when the parameter was created
updated_at	datetime	YES		NULL		when the parameter was last changed

FIG. 36E

Widget Rating:

Field	Type	Null	Key	Default	Extra	
id	int(11)	NO	PRI	NULL	auto_increment	unique id for this rating
widget_id	varchar(36)	NO	MUL			the GUID of the widget being rated
user_id	varchar(36)	NO	MUL			the GUID of the user making the rating
rating	int(11)	NO		0		the value of the rating
version	varchar(32)	NO		1.0		the version of the widget being rated
created_at	datetime	YES		NULL		when the rating was created
updated_at	datetime	YES		NULL		when the rating was last changed

Buddy:

Field	Type	Null	Key	Default	Extra	
id	char(36)	NO	PRI			the unique GUID of the buddy record
profile_id	varchar(36)	NO	MUL			the GUID of profile for which this user is a buddy
user_id	varchar(36)	NO	MUL			the GUID of the buddy
acceptance	varchar(36)	NO		ask		how received widget instances should be handled
created_at	datetime	YES		NULL		when this buddy record was created
updated_at	datetime	YES		NULL		when this buddy record was last modified
hide	tinyint(1)	YES		0		true to hide the relationship from the buddy
accepted	tinyint(1)	YES		1		true if the relationship has been accepted

Chumby Authorization:

Field	Type	Null	Key	Default	Extra	
id	int(11)	NO	PRI	NULL	auto_increment	unique id of this authorization
chumby_id	varchar(36)	NO	MUL			GUID of the chumby that is authorizing
created_at	datetime	YES		NULL		when the chumby authorized
fw	varchar(50)	YES		NULL		version of the chumby hardware
sw	varchar(50)	YES		NULL		version of the chumby software
fw	varchar(50)	YES		NULL		version of the chumby firmware

FIG. 36F

Movie:

Field	Type	Null	Key	Default	Extra	
id	varchar(36)	NO	PRI			GUID of the movie record
content_type	varchar(60)	YES		NULL		mimetype of the movie
name	varchar(500)	YES		NULL		the original filename of the movie
data	mediumblob	YES		NULL		the raw data
created_on	datetime	YES		NULL		when the record was created
updated_on	datetime	YES		NULL		when the record was last changed
widget_id	varchar(36)	YES	MUL	NULL		the GUID of the widget this movie belongs to
flash_version	int(11)	YES		NULL		the version of Flash this movie uses

Template (aka Configuration Movie):

Field	Type	Null	Key	Default	Extra	
id	varchar(36)	NO	PRI			GUID of the configuration movie record
content_type	varchar(60)	YES		NULL		mimetype of the movie
name	varchar(200)	YES		NULL		the original filename of the movie
data	mediumblob	YES		NULL		the raw data
created_on	datetime	YES		NULL		when the record was created
updated_on	datetime	YES		NULL		when the record was last changed
widget_id	varchar(36)	YES	MUL	NULL		the GUID of the widget this template belongs to
flash_version	int(11)	YES		0		the version of Flash this movie uses

Thumbnails:

Field	Type	Null	Key	Default	Extra	
id	varchar(36)	NO	PRI			GUID of the thumbnail record
content_type	varchar(60)	YES		NULL		mimetype of the thumbnail image
name	varchar(200)	YES		NULL		original filename of the thumbnail
data	mediumblob	YES		NULL		raw data
created_on	datetime	YES		NULL		when the record was created
updated_on	datetime	YES		NULL		when the record was last changed
widget_id	varchar(36)	YES	MUL	NULL		the GUID of the widget this thumbnail belongs to

FIG. 36G

FIG. 36H

Chumby Registration:

Field	Type	Null	Key	Default	Extra	
id	int(11)	NO	PRI	NULL	auto_increment	the unique ID for this registration record
token	int(11)	YES	UNI	NULL		the integer token for this registration
user_id	varchar(36)	YES		NULL		the user this chumby is trying to register to
chumby_id	varchar(36)	YES		NULL		the chumby being registered
created_at	datetime	YES		NULL		when the registration record was created

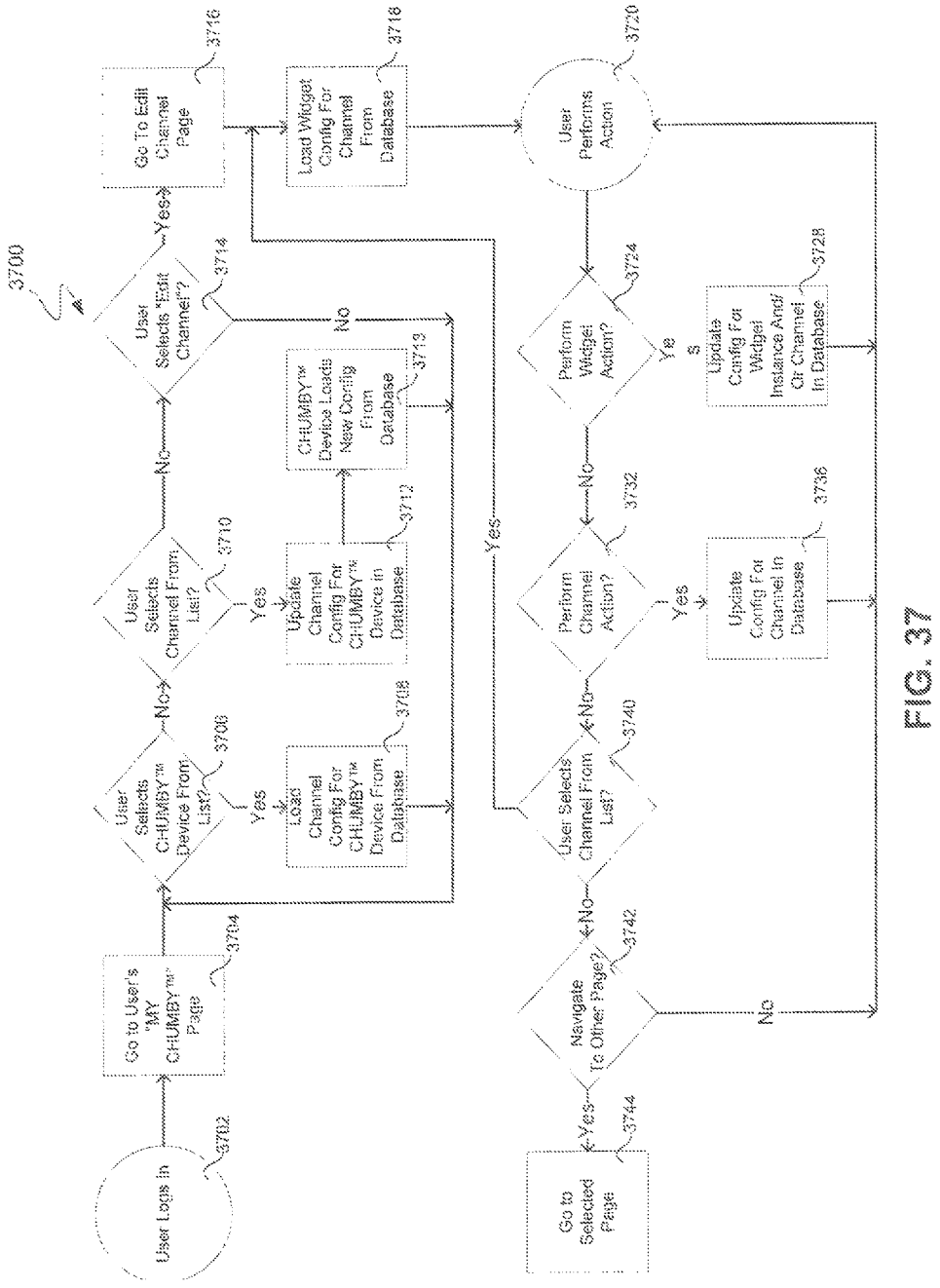

3700
User Logs In
3702
Go to User's "MY CHUMBY™" Page
3704
User Selects CHUMBY™ Device From List?
3706
Yes
No
Load Channel Config For CHUMBY™ Device From Database
3708
User Selects Channel From List?
3710
Yes
No
Update Channel Config For CHUMBY™ Device in Database
3712
CHUMBY™ Device Loads New Config From Database
3713
User Selects "Edit Channel"?
3714
Yes
No
Go To Edit Channel Page
3716
Load Widget Config For Channel From Database
3718
User Performs Action
3720
Perform Widget Action?
3724
Yes
No
Update Config For Widget Instance And/Or Channel In Database
3728
Perform Channel Action?
3732
Yes
No
Update Config For Channel In Database
3736
User Selects Channel From List?
3740
Yes
No
Navigate To Other Page?
3742
Yes
No
Go to Selected Page
3744

FIG. 37

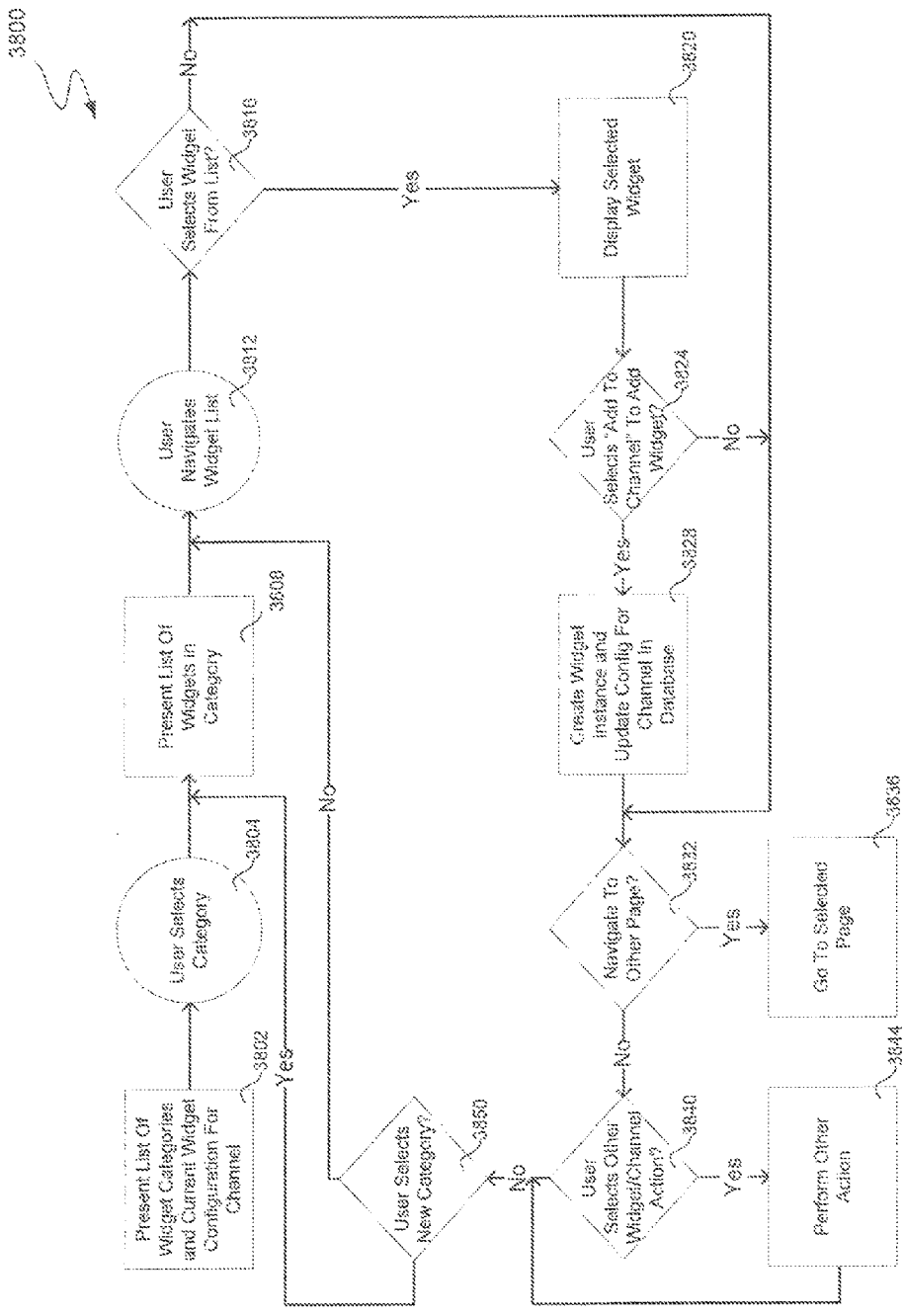

3800
Present List Of Widget Categories and Current Widget Configuration For Channel
3802
User Selects Category
3804
Present List Of Widgets in Category
3808
User Navigates Widget List
3812
User Selects Widget From List?
3816
Display Selected Widget
3820
User Selects "Add To Channel" To Add Widget?
3824
Create Widget Instance and Update Config For Channel In Database
3828
Navigate To Other Page?
3832
Go To Selected Page
3836
User Selects New Category?
3850
User Selects Other Widget/Channel Action?
3840
Perform Other Action
3844
Yes
No

FIG. 38

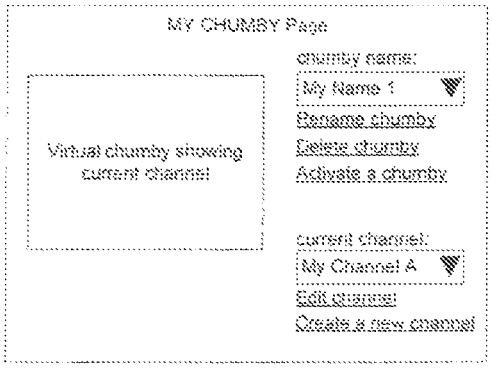


FIG. 39A

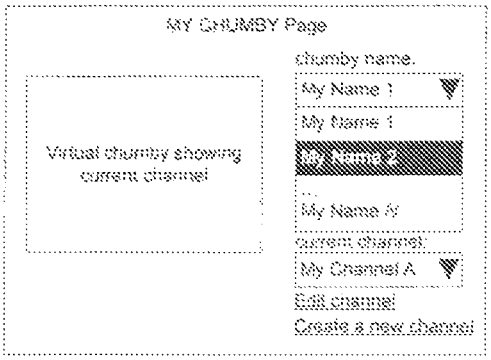


FIG. 39B

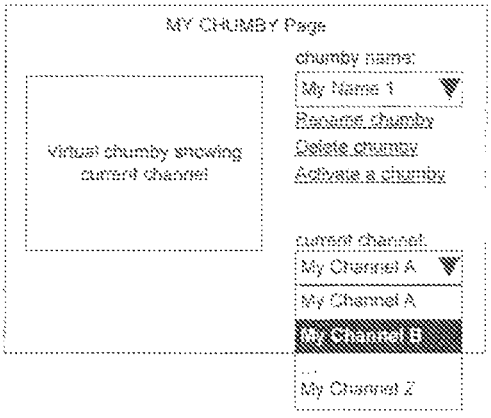


FIG. 39C

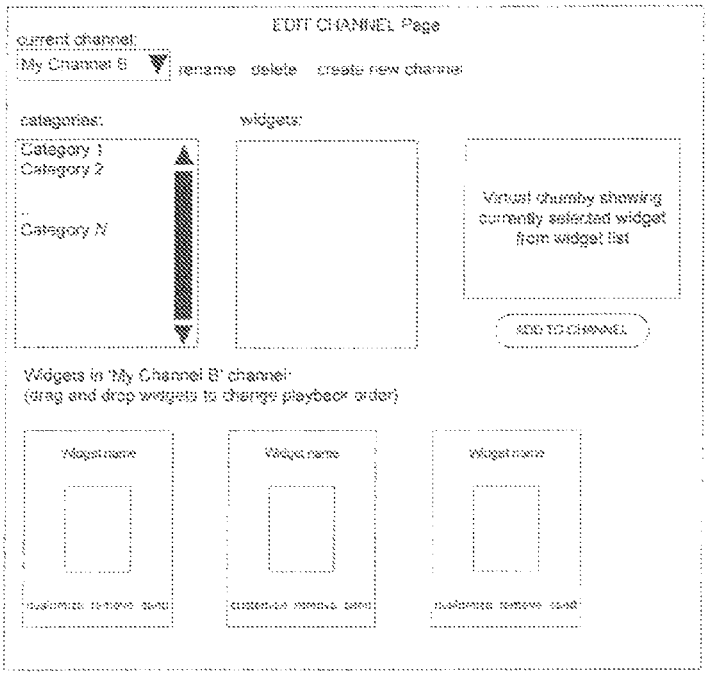


FIG. 39D

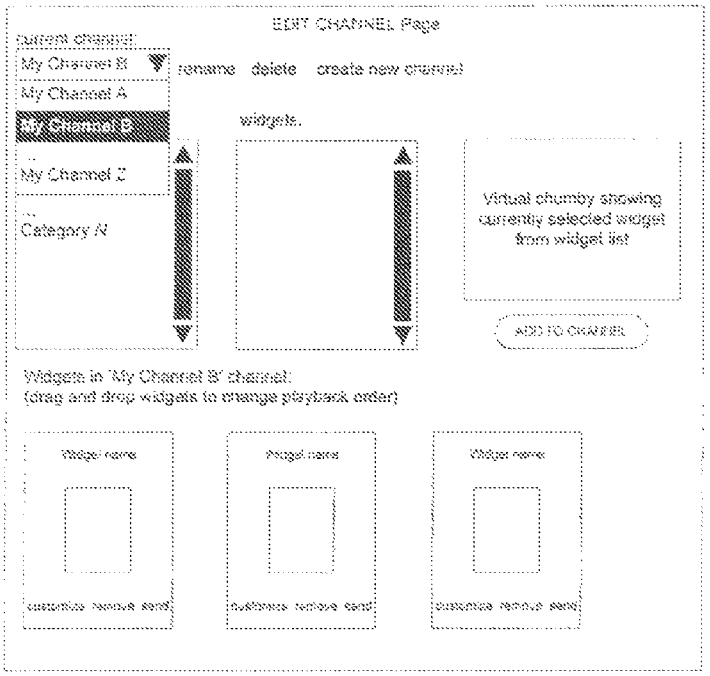


FIG. 39E

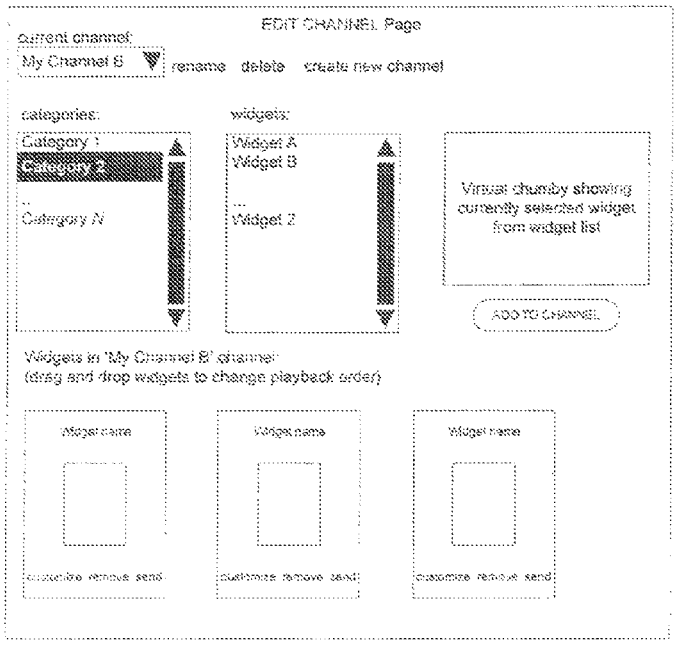


FIG. 39F

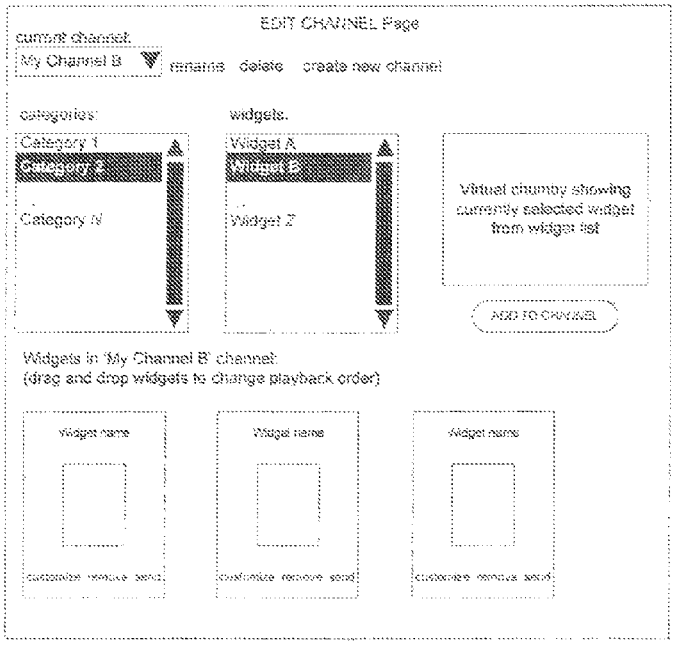


FIG. 39G

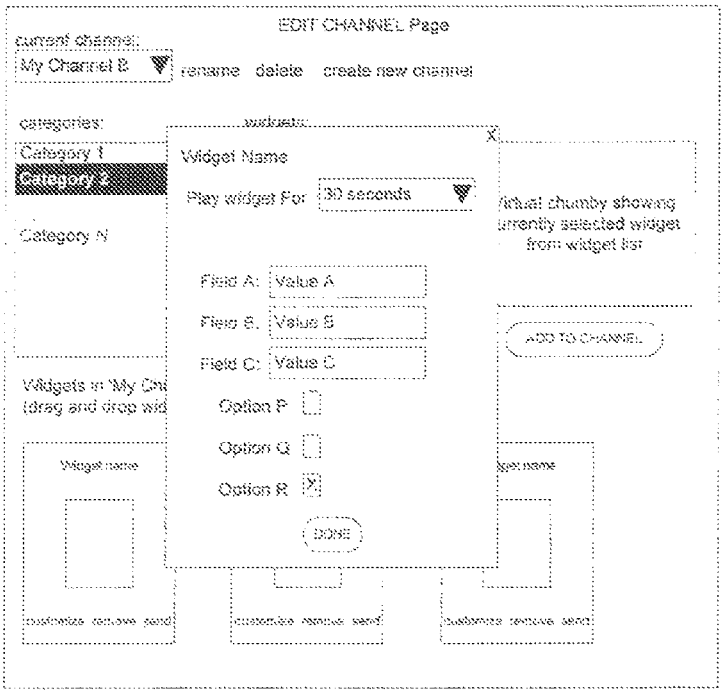

EDIT CHANNEL Page
current channel:
My Channel B
rename
delete
create new channel
categories:
Category 1
Category 2
Category N
Widget Name
Play widget For:
30 seconds
Field A:
Value A
Field B:
Value B
Field C:
Value C
Option P
Option Q
Option R
DONE
ADD TO CHANNEL

FIG. 39H

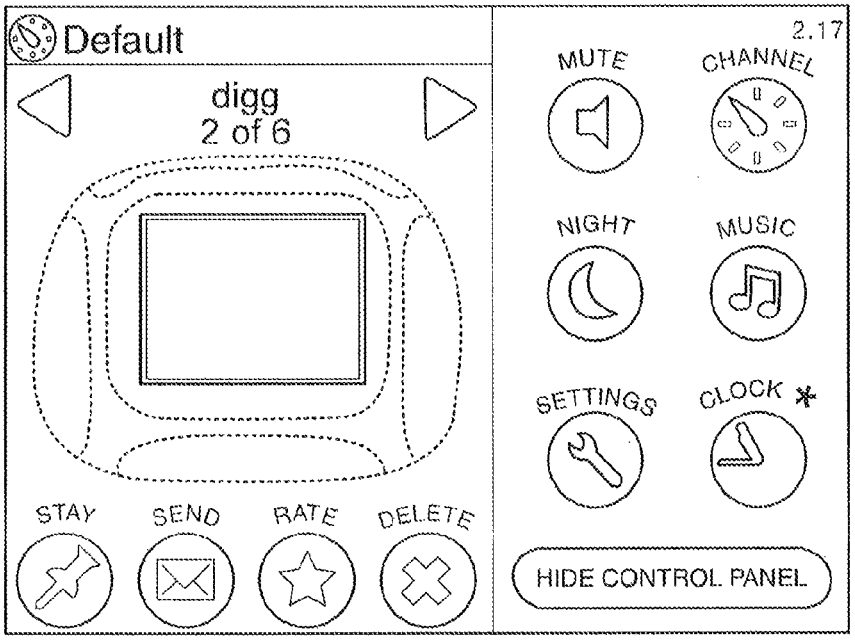


FIG. 40A

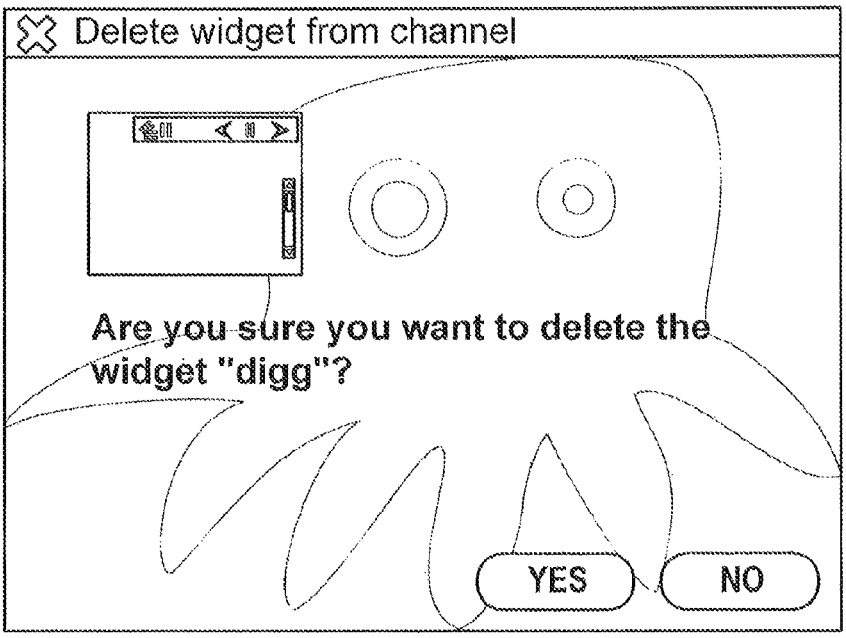


FIG. 40B

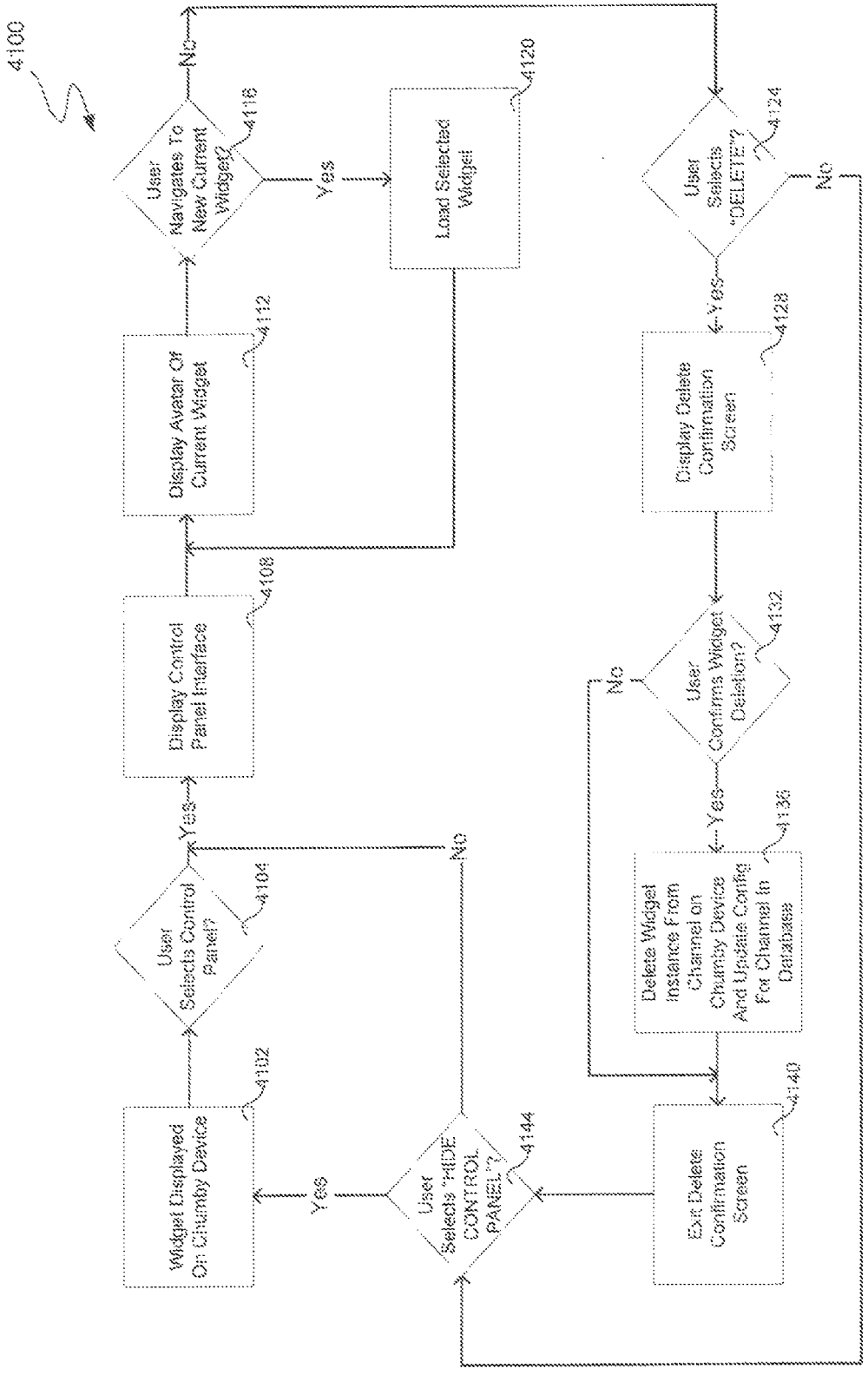

4100
User Navigates To New Current Widget?
4116
No
Yes
Load Selected Widget
4120
Display Avatar Of Current Widget
4112
Display Control Panel Interface
4108
User Selects Control Panel?
4104
Yes
No
Widget Displayed On Chumby Device
4132
User Selects "HIDE CONTROL PANEL"?
4144
Yes
User Selects "DELETE"?
4124
No
Yes
Display Delete Confirmation Screen
4128
User Confirms Widget Deletion?
4136
No
Yes
Delete Widget Instance From Channel on Chumby Device And Update Config For Channel In Database
Exit Delete Confirmation Screen
4140

FIG. 41

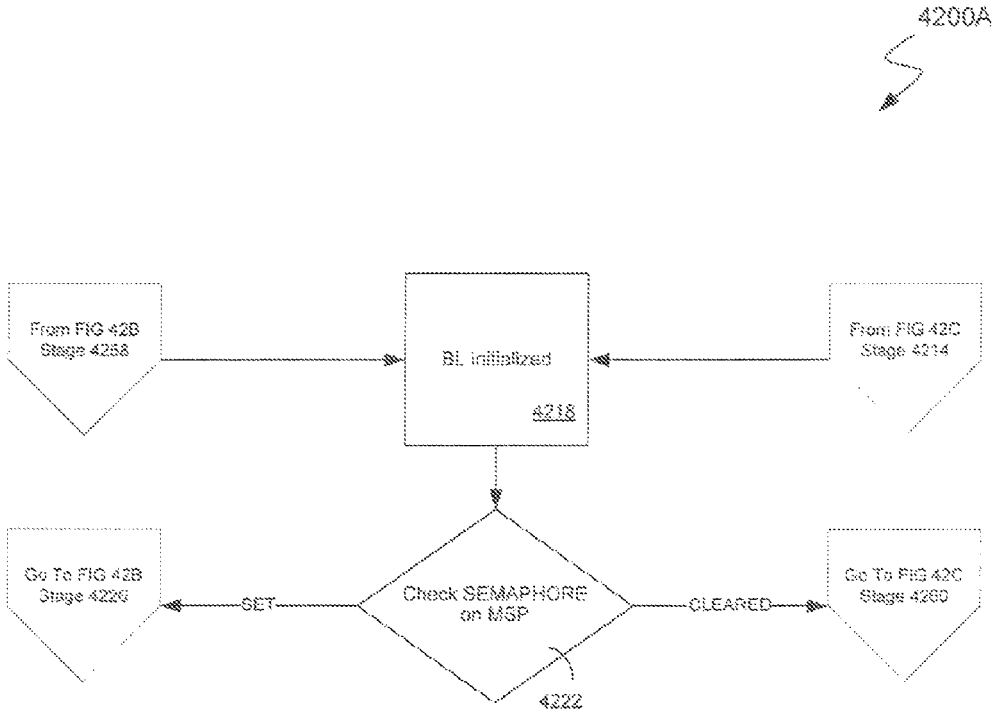

4200A
From FIG 42B Stage 4258
BL initialized
4218
From FIG 42C Stage 4214
Go To FIG 42B Stage 4226
SET
Check SEMAPHORE on MSP
CLEARED
Go To FIG 42C Stage 4260
4222

FIG. 42A

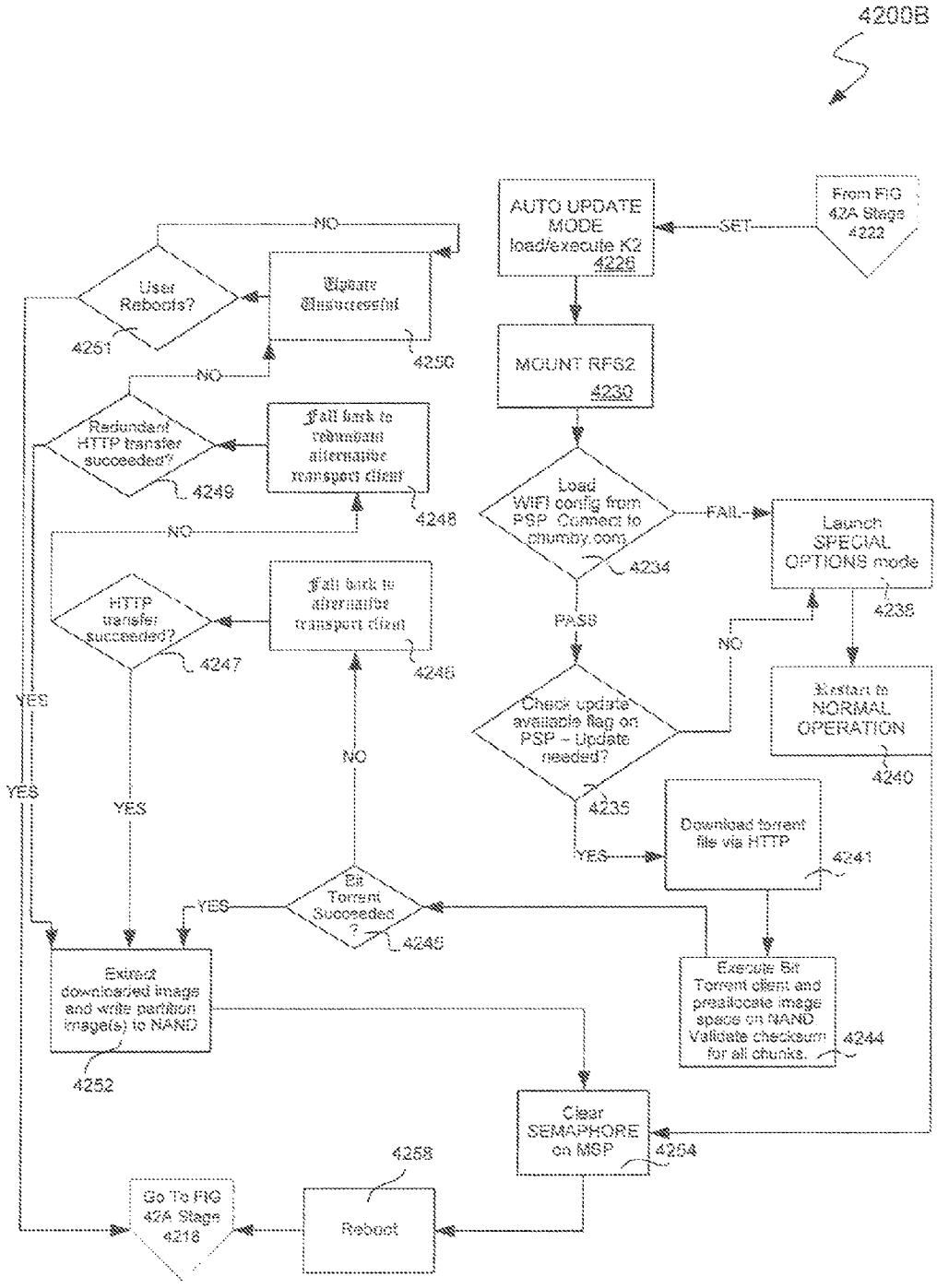

4200B
From FIG 42A Stage 4222
AUTO UPDATE MODE load/execute K2 4226
SET
MOUNT RFS2 4230
Load WIFI config from PSP. Connect to chumby.com 4234
FAIL
Launch SPECIAL OPTIONS mode
4238
PASS
NO
Check update available flag on PSP – Update needed?
4235
YES
Download torrent file via HTTP
4241
Restart to NORMAL OPERATION
4240
Bit Torrent Succeeded ?
4245
YES
NO
Execute Bit Torrent client and preallocate image space on NAND Validate checksum for all chunks.
4244
Extract downloaded image and write partition image(s) to NAND
4252
Clear SEMAPHORE on MSP
4254
4258
Reboot
Go To FIG 42A Stage 4216
HTTP transfer succeeded?
4247
Fall back to alternate transport client
4246
Redundant HTTP transfer succeeded?
4249
Fall back to redundant alternate transport client
4248
User Reboots?
4251
Bypass Unsuccessful
4250
NO
YES

FIG. 42B

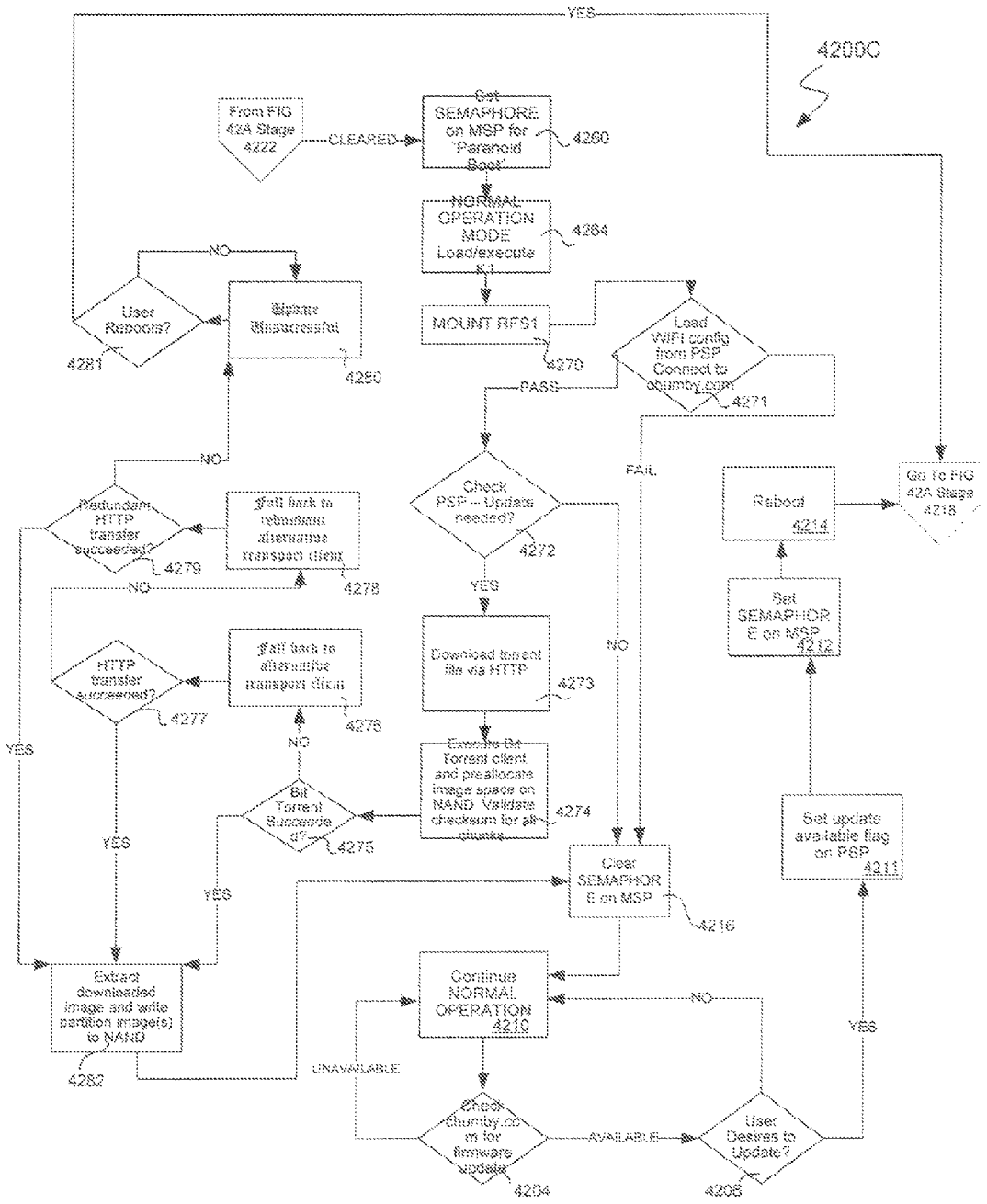

4200C
YES
From FIG 42A Stage 4222
CLEARED
Set SEMAPHORE on MSP for 'Paranoid Boot'
4260
NORMAL OPERATION MODE Load/execute K1
4264
MOUNT RFS1
4270
Load WIFI config from PSP Connect to chumby.com
4271
PASS
FAIL
NO
User Reboots?
4281
Update Unsuccessful
4280
Check PSP – Update needed?
4272
YES
Download torrent file via HTTP
4273
Execute Bit Torrent client and preallocate image space on NAND. Validate checksum for all chunks
4274
Bit Torrent Succeeded?
4275
Redundant HTTP transfer succeeded?
4279
Fall back to redundant alternative transport client
4278
HTTP transfer succeeded?
4277
Fall back to alternative transport client
4276
Reboot
4214
Go To FIG 42A Stage 4218
Set SEMAPHORE on MSP
4212
Set update available flag on PSP
4211
Clear SEMAPHORE on MSP
4216
Continue NORMAL OPERATION
4210
UNAVAILABLE
AVAILABLE
Check chumby.com for firmware update
4204
User Desires to Update?
4208
Extract downloaded image and write partition image(s) to NAND
4282

FIG. 42C

SYSTEM AND METHOD FOR AUTOMATICALLY UPDATING THE SOFTWARE OF A NETWORKED PERSONAL AUDIOVISUAL DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of Ser. No. 13/596,364, filed Aug. 28, 2012 which is a continuation of U.S. patent application Ser. No. 11/845,027, filed Aug. 24, 2007, now U.S. Pat. No. 8,261,256, which will issue on Sep. 4, 2012, which claims priority under 35 U.S.C. §119(e) to U.S. Provisional Application Ser. No. 60/805,830, filed Sep. 5, 2006, entitled CONFIGURABLE PERSONAL AUDIOVISUAL DEVICE FOR USE IN NETWORKED APPLICATION SHARING SYSTEM, to U.S. Provisional Application Ser. No. 60/823,491, filed Aug. 24, 2006, entitled SYSTEM AND METHOD FOR TRANSFERRING ELECTRONIC CONTENT TO NETWORKED PERSONAL AUDIOVISUAL DEVICES, to U.S. Provisional Application Ser. No. 60/823,493, filed Aug. 24, 2006, entitled NETWORKED PERSONAL AUDIOVISUAL DEVICE HAVING FLEXIBLE HOUSING, to U.S. Provisional Application Ser. No. 60/823,496, filed Aug. 24, 2006, entitled SYSTEM AND METHOD FOR AUTOMATICALLY UPDATING THE SOFTWARE OF A NETWORKED PERSONAL AUDIOVISUAL DEVICE, to U.S. Provisional Application Ser. No. 60/945,900, filed Jun. 22, 2007, entitled REGISTRATION SYSTEMS AND METHODS FOR PERSONALIZED PORTABLE DEVICES, and to U.S. Provisional Application Ser. No. 60/869,297, filed Dec. 8, 2006, entitled SYSTEM AND METHODS FOR LOCATION, MOTION, AND CONTACT DETECTION AND TRACKING IN A NETWORKED AUDIOVISUAL DEVICE, each of which is incorporated herein by reference in their entirety. This application is related to U.S. patent application Ser. No. 11/845,018, entitled CONFIGURABLE PERSONAL AUDIOVISUAL DEVICE FOR USE IN NETWORKED APPLICATION SHARING SYSTEM, filed on Aug. 24, 2007, to U.S. patent application Ser. No. 11/845,026, entitled SYSTEM AND METHOD FOR TRANSFERRING ELECTRONIC CONTENT TO NETWORKED PERSONAL AUDIOVISUAL DEVICES, filed on Aug. 24, 2007, and to U.S. patent application Ser. No. 11/845,021, entitled NETWORKED PERSONAL AUDIOVISUAL DEVICE HAVING FLEXIBLE HOUSING, filed on Aug. 24, 2007, all of which are incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

It is well known that broadband Internet connectivity is becoming substantially more pervasive among consumers as a result of competition among service providers utilizing various different technologies (e.g., cable, digital subscriber line (DSL), satellite). In many households personal computers (PCs) constitute the primary users of the bandwidth furnished by these broadband connections. In order to facilitate sharing of the Internet connection among PCs in a given household, a variety of "wired" and "wireless" home networking technologies have been utilized.

As a result of the impracticality of installing Ethernet cable throughout a residence, RF-based wireless networking technology is becoming increasingly commonplace among consumers. Although systems based upon the 802.11b, or "Wi-Fi", wireless networking standard may currently be the most pervasive, versions of the 802.11 standard offering increased bandwidth have been introduced and yet higher-bandwidth approaches have been proposed.

The increased bandwidth available within the home has increased the usage of a number of different services, such as Internet-based delivery of digital audio, video and graphic content. However, since many of these services are facilitated by a desktop or notebook PC capable of communication over a broadband Internet connection, users are forced to remain proximate to their respective computers in order to utilize such services. Although other strategies to leverage the availability of broadband Internet connectivity within the home are currently being developed, many of these approaches involve creation of a relatively powerful, costly centralized communications "hub" (e.g., a PC with enhanced media capabilities, or a multi-purpose cable set-top box). Unfortunately, this typically requires either the purchase of an expensive hardware device or extended subscription plan, and constrains the extent to which Internet-enabled entertainment or other services are enjoyed outside of the immediate vicinity of the centralized hub device.

Accordingly, the increasing availability of wireless bandwidth within the home and elsewhere creates an opportunity for economically leveraging this bandwidth in a flexible, consumer-friendly manner.

SUMMARY OF THE INVENTION

In summary, one aspect of the present invention relates to a method for automatically updating software executed by an electronic device. The method includes receiving, at the electronic device, an update indication from a server that updated software is available for the electronic device. The method further includes modifying, in response to the update indication, a boot state of the electronic device and initiating operation of the electronic device in an update mode. The updated software is received, at the electronic device, during operation in the update mode. The method further includes initiating, upon determining the updated software has been correctly received, operation of the electronic device in a normal mode.

In another aspect the present invention relates to a machine-readable medium having instructions stored thereon for execution by a processor to perform a method. The method includes receiving, at the electronic device, an update indication from a server that updated software is available for the electronic device. The method further includes modifying, in response to the update indication, a boot state of the electronic device. Following initiation of operation of the electronic device in an update mode, the updated software is received at the electronic device. The method includes initiating, upon determining the updated software has been correctly received, operation of the electronic device in a normal mode.

Yet another aspect of the invention relates to a method which involves initially operating an electronic device in a normal mode. The method includes rebooting the electronic device into an update mode following unintended termination of the operation of the electronic device in the normal mode. The method further includes receiving, during operation of the electronic device in the update mode, updated software for the electronic device.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the nature of the features of the invention, reference should be made to the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a block diagram illustrating a set of networked components comprising an exemplary embodiment of the system of the invention.

FIG. **2** illustrates an exemplary distribution of CHUMBY™ devices throughout a residence or other building having a number of rooms.

FIG. **3** provides a block diagrammatic representation of the principal components of an embodiment of a CHUMBY™ device of the present invention.

FIG. **4** shows an exemplary user interface generated through a screen of a CHUMBY™ device during operation of the CHUMBY™ device in a control panel mode.

FIGS. **5**A-**5**E provides various perspective views of an exemplary CHUMBY™ device configured with a malleable housing.

FIGS. **6**A-**6**D provide various partially transparent perspective, side and plan views of an embodiment of the CHUMBY™ device.

FIGS. **6**E-**6**G depict the core electronics and other components contained within the housing of a CHUMBY™ device and the arrangement of certain of these components within a housing of the device.

FIG. **7** provides a block diagrammatic representation of the server components and other infrastructure which may be utilized to facilitate the operations of a CHUMBY™ service provider.

FIG. **8** provides a database model diagram of an exemplary object-oriented database schema utilized by a system database.

FIG. **9** is a signal flow diagram representative of one manner m which a configuration is provided to a CHUMBY™ device by a service provider.

FIG. **10** is a signal flow diagram which represents one manner in which a profile is provided to a CHUMBY™ device by a service provider.

FIG. **11** is a signal flow diagram which depicts processing of changes made to the parameters of a widget instance through the interface of a CHUMBY™ device in which the widget is instantiated.

FIG. **12** shows a signal flow diagram illustrating an exemplary widget instance download operation in which a service provider is requested to push values of widget-specific parameters to a requesting CHUMBY™ device.

FIG. **13** is a signal flow diagram which illustratively represents the process of obtaining content from the service provider for a widget of a CHUMBY™ device.

FIG. **14** is a flowchart which depicts an exemplary sequence of operations performed by a CHUMBY™ device upon initial power-up.

FIG. **15** is a flowchart illustrating an exemplary routine used to calibrate a touchscreen of a CHUMBY™ device.

FIGS. **16**A-**16**D provide a set of screen shots of the user interface of a CHUMBY™ device being calibrated pursuant to the routine of FIG. **15**.

FIG. **17** is a flowchart illustrating the operations performed in selecting a wireless base station upon initial power-up of a CHUMBY™ device.

FIG. **18** is a flowchart of an exemplary account creation and registration process.

FIG. **19** is a flowchart representative of an exemplary Web-based interaction between a user and a service provider in connection with associating a particular CHUMBY™ device with the user's account.

FIG. **20** is a flowchart of an exemplary Web-based interaction between a user and the service provider with regard to disabling a CHUMBY™ device that has been previously associated with the user's account.

FIG. **21** is a flowchart of an exemplary Web-based interaction between a user and the service provider in connection with "mirroring" CHUMBY™ devices.

FIG. **22** is a top-level flowchart of exemplary Web-based or CHUMBY™ device-based interaction between a device user and the service provider with regard to adding, removing and configuring widget profiles relative to the user's CHUMBY™ device.

FIG. **23** is a flowchart representative of exemplary Web-based or CHUMBY™ device-based interaction between a device user and the service provider with respect to the addition of widgets to the current configuration of the user's CHUMBY™ device.

FIG. **24** is a flowchart representative of exemplary Web-based or CHUMBY™ device-based interaction between a device user and a service provider in connection with the removal of widgets from a channel, which may also be active on the user's CHUMBY™ device.

FIG. **25** is a flowchart depicting an exemplary set of operations involved in configuring parameters specific to of one or more widgets currently associated with a given CHUMBY™ device.

FIGS. **26**A-**26**E are screen shots of exemplary user interfaces presented by a Web browser used to facilitate certain of the processes described by FIGS. **22**-**25**.

FIG. **27** is a signal flow diagram which illustratively represents the process of downloading the code for a widget from a service provider.

FIG. **28** provides an alternative illustration of a CHUMBY™ device in which is identified a core electronics unit and flexible housing of the device.

FIG. **29** illustrates various components interior to a flexible housing of an exemplary CHUMBY™ device.

FIGS. **30**-**31** provide an example of a flat pattern used to define the exterior structure of a flexible housing of an exemplary CHUMBY™ device.

FIGS. **32**-**33** show exemplary user interface screens of a CHUMBY™ device applicable to a process for calibration of one or more bend sensors within the device.

FIG. **34** is a process flow diagram of a text/image processing service within the infrastructure of CHUMBY™ service provider configured to parse e-mail messages from mobile devices and extract the relevant content.

FIG. **35** is a process flow diagram illustrating an alternate implementation of an image processing service for CHUMBY™ devices.

FIGS. **36**A-**36**H provide a more comprehensive tabular representation of an exemplary object-oriented database schema capable of being utilized by the system database.

FIG. **37** is a top-level flowchart of exemplary Web-based interaction between a device user and the service provider with regard to adding, removing and configuring widget profiles relative to the user's CHUMBY™ device.

FIG. **38** is a flowchart representative of exemplary Web-based interaction between a device user and the service provider with respect to the addition of widgets to the current configuration of the user's CHUMBY™ device.

FIGS. **39**A-**39**H are screen shots of exemplary user interfaces presented by a Web browser used to facilitate certain of the processes described by FIGS. **25** and **37**-**38**.

FIGS. **40**A-**40**B are screen shots of exemplary user interfaces presented by a CHUMBY™ device used to facilitate certain of the processes described by FIG. **41**.

FIG. **41** is a flowchart representative of exemplary CHUMBY™ device-based interaction between a device user and a service provider in connection with the removal of widgets from the current channel of the user's CHUMBY™ device.

FIGS. **42**A-C are flowcharts illustrating an exemplary sequence of operations performed to automatically update all or part of the software maintained within non-volatile memory of a CHUMBY™ device.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Overview

The present invention generally relates a system comprised of a set of personalized audiovisual devices in Internet-based communication with a service provider. It is anticipated that

the personalized audiovisual devices will be commercially distributed under the trademark CHUMBY™, and may also be referred to herein as "CHUMBY™ devices". During communication with the service provider, each CHUMBY™ device periodically receives a set of application programs, or "widgets", which are sequentially executed by the CHUMBY™ device after being received from the service provider or locally from a personal computer (e.g., via a USB connection). Since each CHUMBY™ device is typically Internet-enabled, each may also be remotely configured and otherwise personalized via the CHUMBY™ service provider through a Web browser executed by a remote terminal (e.g., a PC or wireless handset). Such personalization may include, for example, specifying the set of widgets provided to a given CHUMBY™ device as well as their sequence and priority of execution.

As is described hereinafter, it is a feature of embodiments of the invention that a user configuring a CHUMBY™ device via an interface provided by the CHUMBY™ service provider may "drag and drop" icons representative of various widgets onto a rectangular or other portion of the interface representative of the screen of the CHUMBY™ device being configured. Alternatively, a user may select textual and/or graphical representations of widgets and select a button or other graphical representation of a user interface (UI) control to "add" the widget to the CHUMBY™ device being configured. In these ways the "layout" of the screen of the CHUMBY™ device may be remotely configured by the owner of the device. Although each CHUMBY™ device will preferably be capable of being configured in this manner, in certain embodiments each may also come "loaded" with a default set of widgets (e.g., an "alarm clock" widget) disposed to be executed by the CHUMBY™ device upon its registration with the CHUMBY™ service provider. Once a CHUMBY™ device has been configured (i.e., with either a "default" or user-specified configuration), it may execute the widgets defined by the configuration without user intervention. Alternatively, users may opt to "stay" on a given widget by explicitly instantiating the system interface on the device and selecting a "stay" UI control. If a user has explicitly selected a widget to "stay", the sequential execution of widgets can be continued by terminating the "stay" command via the system interface. If a user interacts with a widget which presents user interface controls to the user through one of a number of alternative input methods, such as via a touchscreen or accelerometer, the currently active widget will continue to execute on the device until some timeout period expires following the cessation of user interaction with the widget.

The configuration of a CHUMBY™ device may also specify the events or conditions under which the sequence of execution of widgets is to be altered or interrupted, and allows certain widgets to be accorded the highest available priority with respect to execution. For example, an "alarm clock" widget could be granted such priority in order to ensure that its alarm function would not be prevented from being actuated at the scheduled time due to contemporaneous execution of another widget. In one embodiment the Web interface provided by the CHUMBY™ service provider is in the form of a "timeline" enabling the sequence of execution of the widgets associated with a given CHUMBY™ device to be controlled in an intuitive manner. In an exemplary implementation the timeline defines the order in which the widgets are to be played in a constantly repeating sequence; that is, the timeline is representative of the complete set of widgets played by a given CHUMBY™ device as well as their relative order and duration of execution. However, certain widgets (e.g., the "alarm clock" widget) can be specified to be actuated at a given time by appropriately setting the applicable configuration element of such widgets.

Although in exemplary embodiments it is not contemplated that more than a single "content-related" widget be operative at any given time, a system configuration widget may be utilized to run concurrently with each such content-related widget in order to, for example, control the relative priority of execution of such content-related widgets and system settings such as loudness, brightness, navigation, and the like.

In one embodiment CHUMBY™ devices are each capable of wireless communication in accordance with an accepted wireless networking standard, such as the 802.11b or 802.11g standard. Accordingly, in homes or other environments containing one or more wireless access points, multiple CHUMBY™ devices may be distributed throughout the coverage area of the access points. Alternatively, a CHUMBY™ device may use a wired connection as a backup to, or in lieu of, a wireless connection to the extent convenient or necessary.

Among the features of the invention is the capability of the interface presented by each CHUMBY™ device to change in accordance with the nature of the widget currently being executed by the device. For example, a "clock radio" widget could be employed to produce audio and visual imagery consistent with a conventional alarm clock at an appointed time in the morning. In exemplary embodiments the clock radio widget would allow for the selection of a standard "wake up" chime or choice of several different audio programs. Later in the day the device interface could be devoted to a rotating selection of several standard information screens such as news headlines, local weather, sports scores, stock market updates, horoscope and the like.

In accordance with another aspect of the invention, users of CHUMBY™ devices may optionally participate in a "CHUMBY™ Network" along with other users by logging on to a Web site (e.g., www.chumby.com) hosted by the CHUMBY™ service provider. At this site (also referred to hereinafter as the "CHUMBY™ site") a user will be able to register with the CHUMBY™ Network and access services enabling the basic capabilities of the user's CHUMBY™ device. Basic capabilities may comprise, for example, the opportunity to send/receive widgets and other content to/from other CHUMBY™ users, for improved personalization of the device's generic information features, more detailed alarm-setting capabilities, and better selection and configuration of audio capabilities.

Registration with the CHUMBY™ Network, which would potentially require payment of a periodic subscription fee, enables members of the Network to access a wide array of widgets. It is contemplated that certain of such widgets would be developed by the entity operating the CHUMBY™ Network while other widgets would be developed by independent developers. In addition, members of the "CHUMBY™ Network would also be able to communicate with the CHUMBY™ devices of other members, provided that permission for such communication has been authorized by the other members. Such communication could entail, for example, the sending of a widget and corresponding data from the CHUMBY™ service provider to a member of the CHUMBY™ Network (the "receiving member") in response to a request sent to the CHUMBY™ service provider by another member (the "sending member"). For example, a sending member could, after receiving permission from a receiving member, request the CHUMBY™ service provider to send a "photo-viewer" widget to the receiving member. In addition, the sending member could specify that a link be established between the photo-viewer widget and pictures uploaded by the sending member to the CHUMBY™ service provider. In this way the receiving member could, without any effort other than providing authorization to the sending member, enable their CHUMBY™ device to essentially automatically receive and display a sequence of photos provided by the sending member. Similarly, while traveling a sending member could send a personalized "wake up" message to the CHUMBY™ device of a consenting receiving member. Finally, a sending member could send widgets to a group of receiving members included on a "buddy list" of the sending member, which could be established after the receipt of suitable permissions from those proposed to be included on the list.

In an exemplary embodiment members of the CHUMBY™ Network are enabled to completely configure, through any Web browser, their respective CHUMBY™ devices by specifying a set of "premium" widget programs or content to play or be shown rotationally (or in some other user-defined sequence) on their respective CHUMBY™ devices. Such premium widgets and content may include, for example, webcam shots. RSS readers, filtered news reports, personalized stock performance data, short animations or movies, podcasts or audio files to function as the audio sources for alarms or reminders scheduled to be triggered at different times throughout the day.

As is discussed further below, one exemplary implementation of a CHUMBY™ device is comprised of a malleable housing attached to a rigid "core" structure supporting a display screen and the electrical components of the device. The malleable housing would generally encompass all of the electrical components of the CHUMBY™ device, and will preferably be filled with an appropriate material or otherwise constructed to enable it to be "squeezed" or otherwise deformed by a user. Moreover, the core structure is designed to be capable of being removed from the housing and mated in to a different housing. A set of "squeeze sensors" are enclosed by the malleable housing in order to permit the detection of such a squeezing or similar action by a user. In this way a user is afforded the opportunity of conveying information through physical deformation of the CHUMBY™ device in addition to the more conventional textual and other modes of communication facilitated by the display screen. For example, in one exemplary system a user could initiate the conveying of a "hug" to another user by squeezing the housing of the user's CHUMBY™ device in a particular manner. The electrical signals generated by the sensor array in response to this squeeze would be appropriately interpreted and the user's CHUMBY™ device would communicate, via the CHUMBY™ service provider, a "hug" message to the intended recipient user. At this point the recipient's CHUM BY™ device could register receipt of the hug message by, for example, illuminating an indicator light or sending a message to the display of the device. Significantly, the CHUMBY™ device is not limited to an implementation in a malleable housing; all of the features associated with such a malleable housing may be emulated using a rigid housing in combination with alternative sensors (e.g., force-sensitive or virtually emulated sensors).

System Components

FIG. **1** is a block diagram illustrating a set of networked components comprising an exemplary embodiment of the system **100** of the invention. As shown, the system **100** comprises one or more CHUMBY™ personal audiovisual devices **102** in communication with a central service provider **106** via one or more access networks **110** and the Internet **116**. As those skilled in the art will appreciate, the access networks **110** are representative of various intermediary network routing and other elements between the Internet **116** and the CHUMBY™ personal audiovisual devices **102**. Such intermediary elements may include, for example, gateways or other server devices, and other network infrastructure provided by Internet service providers (ISPs). As is discussed below, the CHUMBY™ personal audiovisual devices **102** obtain application programs ("widgets") for execution from the central service provider **106** or locally from a mass storage device, personal computer or other computing device. In this regard the service provider **106** typically contains a repository of widgets and has access to other content capable of being communicated to a given CHUMBY™ device **102** upon the request of its authorized user or another user to which appropriate permission has been granted.

Referring again to FIG. **1**, the system **100** also includes a plurality of user computers **120** disposed for communication with the service provider **106** via an access network (not shown) and the Internet **116**. Each user computer **120** executes a Web browser **122** capable of displaying Web pages generated by the service provider **106** through which a user may configure one or more CHUMBY™ personal audiovisual devices **102**. As mentioned above, such configuration may include, for example, specifying a set of widgets to be sent to a particular device **102** and their sequence of execution, adjusting audio or visual parameters relating to such execution, defining and managing a user's CHUMBY™ network (including, for example, defining a "buddy list" comprised of other CHUMBY™ users with respect to which the device **102** is permitted to communicate), and defining the layout or other aspects of the user interface presented through the screen of the device **102**. To this end a given Web browser **122** may, when in communication with the service provider **106**, present a rectangular configuration window which displays the widgets currently configured to "play" within the named "channel". By "dragging and dropping" iconic representations of widgets or content files into such a configuration window, a user may personalize the behavior and user interface presented by the corresponding CHUMBY™ device **102**. Alternatively, a user may select textual and/or graphical representations of widgets and select a button or other graphical representation of a user interface control to "add" the widget to the CHUMBY™ device being configured. Moreover, users may access the service provider **106** via a Web browser **122** for the purpose of sending widgets or other information to other users for execution or display by their respective CHUMBY™ devices **102**. In one embodiment the service provider **106** maintains a record of the permissions granted among users of CHUMBY™ devices in order to determine which users are authorized to provide, via the service provider **106**, a given user with widgets, messages or other information, and vice-versa. Such permissions may be granted or withdrawn by a given user via appropriate pages presented by a Web browser **122** in communication with the service provider **106**.

In the exemplary embodiment a configuration window may be utilized to configure one or more CHUMBY™ devices **102** consistent with the permissions granted by the users of such devices **102**. In addition, a user of a given CHUMBY™ device **102** may elect to have the interface of the device **102** "mirror" or otherwise replicate that of another device **102** subject to the requisite permissions being granted. Similarly, one or more CHUMBY™ devices **102** may be configured to mirror the interface for a "virtual" CHUMBY™ device (or vice-versa) defined via a configuration window.

Different users of a given CHUMBY™ device **102** may be accorded different roles or privileges in configuring the device **102**. For example, user-granted supervisory privileges could be given the authority to filter or monitor the widgets or content sent to the CHUMBY™ device **102**. This would enable, for example, parents to manage and/or monitor the widgets and content executed and displayed by the one or more CHUMBY™ devices **102** used by their children. Moreover, administrators of the system **100** would typically possess an elevated level of privilege relative to users of CHUMBY™ devices **102** within the system **100**. Also, if a specific widget performs functions requiring communication with a web site controlled by a third party in order to access content, the developer of the widget may create a hierarchical user model to regulate such access (and perhaps the functions of the widget).

Attention is now directed to FIG. **2**, which illustrates an exemplary distribution of CHUMBY™ devices **102** throughout a residence **200** or other building having a number of rooms **204**. In the embodiment of FIG. **2**, each CHUMBY™ device **102** is equipped with wireless transceiver (e.g., a Wi-Fi transceiver) to facilitate communication with one or more

access points **210**. Each access point is interconnected with an access network **110** by way of, for example, a local area network, thereby enabling Internet-based communication to be established between the service provider **106** and the devices within the residence **200**.

Turning now to FIG. **3**, a block diagrammatic representation is provided of the principal components of an embodiment of a CHUMBY™ device of the present invention. As shown, the device includes a central processing unit (CPU) **302**, memory including volatile (e.g., SDRAM) **306** and non-volatile memory **310** (e.g., flash memory), an audio interface **312**, a wireless communications interface **314**, and a sensor interface **370**. In an exemplary implementation the CPU **302** comprises a microprocessor (e.g., based upon an ARM core) configured to run a Linux kernel and having attendant capabilities for graphics rendering. The device may or may not include a battery backup unit, which serves to preserve real-time information in the event of a power outage, and may also serve as a primary power source if the user desires untethered operation. The battery may or may not be rechargeable. The operating system is made aware of the power status and actively configures the CHUMBY™ device and the running widget to either save power or modify the user interface consistent with untethered operation.

The device may or may not include a Security Module (not shown) If included, the Security Module serves to store secrets and compute authentication algorithms in a fashion that fully isolates core security routines from otherwise unsecured code running on CPU **302**. The secret storage and authentication capability may or may not be used by the client-server communication protocol to enable authenticated and encrypted communication capabilities for, among other things, financial transactions. The Security Module is initialized in such a way that there is no default mapping of the secrets contained within the module versus the identity of the hardware of the user. Furthermore, the secrets are revocable and a routine may exist for generating new secrets based upon a master secret that is never associated with a specific user's profile. This enables opt-in policies for privacy and a limited ability to revoke identity information, barring forensic network analysis, thereby enabling anonymity as well. The anonymous trust network can be extended with a variety of client-server protocols to enable a wide range of anonymous transactions, including but not limited to cash and content transactions.

As shown, software comprising widgets **350** or other applications received from the service provider **106** are stored in memory **310** and loaded into SDRAM **306** or non-volatile memory **310** for execution by the CPU **302**. In one embodiment widgets are downloaded from the service provider **106** to CHUMBY™ devices in the format of a "Adobe Flash" file, also referred to as a "Flash movie". As is known by those skilled in the art, Flash movies are usually accorded a ".swf" file extension and may be played by a Flash Player developed and distributed by Adobe Systems. Accordingly, the memory **310** also includes a Flash Player **360** as well as a copy of the operating system **364** executed by the CPU **302**. In other embodiments widgets may be developed in accordance with other formats and played by players compatible with such other formats.

In the exemplary embodiment widgets are not "permanently" stored in memory **310** of CHUMBY™ devices. Rather, widgets are executed by the CPU and then either discarded or cached in temporary memory for future use. This enables widgets to be "pushed" from the service provider **106** as necessary to support the sequence of widget execution specified for each CHUMBY™ device. That is, the service provider **106** may operate to provide a "stream" of widgets to each CHUMBY™ device, where the widgets within each such stream are temporarily cached within the memory of the applicable CHUMBY™ device until their execution. This enables the service provider **106** and/or the creator of each widget program to maintain a degree of control over the content and behavior of each widget program, since each such program is typically not permanently downloaded (thereby facilitating modification) but is rather temporarily cached and erased after some predetermined time has passed or a memory use threshold has been reached.

The CHUMBY™ device also includes a liquid crystal display (LCD) **320** controlled by an LCD controller **322**, which may or may not be integrated into the CPU **302**. The display **320** visually renders iconic representations of the widget programs stored within the CHUMBY™ device and images generated in connection with the execution of such widgets by the CPU **302**. In an exemplary implementation a touchscreen **330** overlays the LCD **320** and is responsive to a touchscreen controller **334**. In one embodiment a user may induce the CHUMBY™ device to enter a "control panel mode" by touching the a sensor such as the squeeze sensor (not shown in FIG. **3**), touchscreen **330** or other sensor device. In an exemplary embodiment, widgets and the system control panel may present the user with different "user interface", or "UI", elements to enable the user to interact with the widget/system control panel. These UI elements may include, but are not limited to, buttons, scroll bars, drop down combo boxes and menus. When a user touches the screen to interact with one of these UI elements, the touchscreen controller **334** informs the CPU **302** that the touchscreen has been touched at a specific location and that location is converted by the CPU **302** to a UI control actuation event based on the configuration of the currently displayed widget **350** or system control panel screen (not shown in FIG. **3**). In alternate implementations the LCD **320** and touchscreen **330** may comprise an integral device controlled by an integrated controller.

Turning to FIG. **4**, there is shown an exemplary user interface **400** generated by the LCD **320** during operation of the CHUMBY™ device in control panel mode. As shown, the interface **400** defines an mute button **404**, a channel button **406**, a night button **408**, a music button **410**, a settings button **412**, a clock button **414**, a delete button **418**, a rate button **420**, a send button **422**, a stay button **424**, a right arrow button **428**, a left arrow button **426**, and a hide control panel mode button **416**. Selection of the mute button **404** toggles the mute state of the CHUMBY™ device. Selection of the channel button **406** instantiates another control panel screen which enables users to view the content of all of their CHUMBY™ "channels" and/or select a new "channel" to be loaded and run on the CHUMBY™ device. A "channel" is a collection of widgets configured by a user in named grouping via an interaction between a page rendered on a web browser **122** and the CHUMBY™ service provider, such collection of widgets generally running on the CHUMBY™ device in a sequential, repetitive fashion.

Selection of the night button **408** places the CHUMBY™ device into a "night mode" in which the screen is dimmed and a low intensity clock is displayed. Selection of the music button **410** instantiates another control panel screen which enables the user to interact with and control various continuous music sources, such as, for example, MP3 players, storage devices, and music services. Such sources may reside on either the local network or on the Internet. Selection of the settings button **412** instantiates another control panel screen which enables the user to configure various CHUMBY™ device settings, such as, for example, wireless network setup, speaker volume and touchscreen calibration. Selection of the clock button **414** instantiates another control panel screen which enables the user to configure the time, date and alarm functions of CHUMBY™ device. Selection of the delete button **418** deletes the currently displayed widget to be deleted, with user confirmation, from the current "channel". Selection of the rate button **420** instantiates another control panel screen which enables the user to provide a rating on a fixed scale for the currently displayed widget. Selection of the send button icon **422** instantiates another control panel screen

which displays a personalized list of other users of CHUMBY™ users to which it may be desired to send widgets or otherwise communicate. Selection of the stay button **424** toggles the "stay" state of the currently selected widget. When the "stay" state of a widget is selected, the widget plays continuously on the CHUMBY™ device. Selection of the right arrow button **426** or left arrow button **428** causes the CHUMBY™ device to display the previous or next widget in the channel, respectively. A user may, from any Web browser **122**, access a Web page generated by the service provider **106** and designate a "favorite" widget. Alternatively, a user may press a virtual, touchscreen-based button on his or her CHUMBY™ device **102** to designate the current widget as the new "favorite" widget. When the user then selects the heart-shaped icon (not shown in FIG. **4**) on his or her CHUMBY™ device, an iconic representation of this favorite widget (e.g., a clock widget) replaces the heart-shaped icon and enables the user to immediately activate (i.e., cause the CPU **302** to execute) the program instructions corresponding to such favorite widget. Alternatively, selection of the heart-shaped icon (or other predefined icon) results in the CHUMBY™ device becoming configured in accordance with a "favorite" or other profile rather than executing a favorite widget. Of course, certain profiles may be specified to include only a single widget such as, for example, an "alarm clock" or "photo viewer widget.

Referring again to FIG. **4**, selection of the right arrow button **426** advances one widget in a user-defined (or default) widget sequence ("channel"), or just skips ahead in implementations in which widgets are chosen to be displayed randomly. Similarly, selection of the left arrow button **428** results in "going back" one widget in the user-defined (or default) widget sequence ("channel"). As the buttons **426** and **428** are selected, an iconic representation or avatar corresponding to the currently active widget is displayed in a display box **430**. If it is desired to return to the currently active widget, the hide control panel mode button **416** is selected and the control panel mode interface **400** changes to a screen through which the user views the sequence of widgets currently configured to be executing on the CHUMBY™ device.

In certain embodiments a physical button element (not shown) may be provided proximate the LCD screen **320** to enable navigation through menus and the like presented by the LCD screen **320**. In one implementation this button element is cross-shaped in order to facilitate two-dimensional navigation, and may further include a smaller, dedicated button (e.g., in the center of the cross) associated with a specific widget (e.g., clock widget). Pressing this dedicated widget would interrupt the operation of all other widgets.

In implementations in which two-dimensional navigation through the user interface of the CHUMBY™ device is supported, users may be provided with the ability to navigate forward and back in the configured widget timeline. Similarly, users may navigate up and down a stack of related widgets. This function depends on the implementation of the concept of widget categories—i.e., associating widgets into logical categories that can be displayed sequentially, if configured to be displayed. An example of a category could be "News". Widgets included within this category could include, for example, a local news widget, a sports news widget, an entertainment news widget, a business news widget, and the like. For each category, there would be a default widget, which is designated by the user on the CHUMBY™ web site for each category selected to be displayed by the user's CHUMBY™ device.

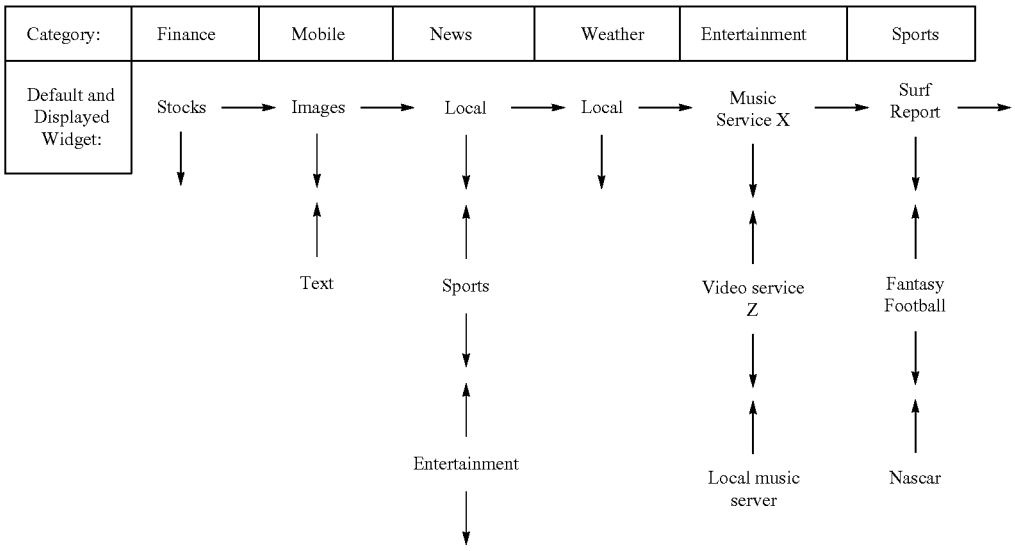
If more than one widget in a category is selected, then the widgets are conceptually "stacked" with the default widget being:

on the top of the stack; and

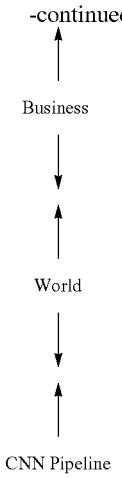
the widget that is displayed as the CHUMBY™ device automatically cycles through configured widgets.

If a widget for a given category (e.g., "News") is displayed and there exist additional widgets in the category which are also configured for display, then in the exemplary embodiment these additional widgets are "stacked" below the displayed widget. In this case the user may take some predefined action with respect to the user's CHUMBY™ device (e.g., perhaps selecting a control on the touchscreen or accessing a function via the control panel, which is instantiated via actuating the squeeze sensor) in order to cause the next widget in the "stack" for that category to be displayed. The CHUMBY™ device may be configured such that taking further predefined actions of the same type will cause the widgets either above or below in the stack to be displayed, as designated by the user. The last widget that is displayed in the stack for the applicable category when the CHUMBY™ device cycles to the next widget category will be the widget displayed in the next cycle for the just exited category (e.g., News).

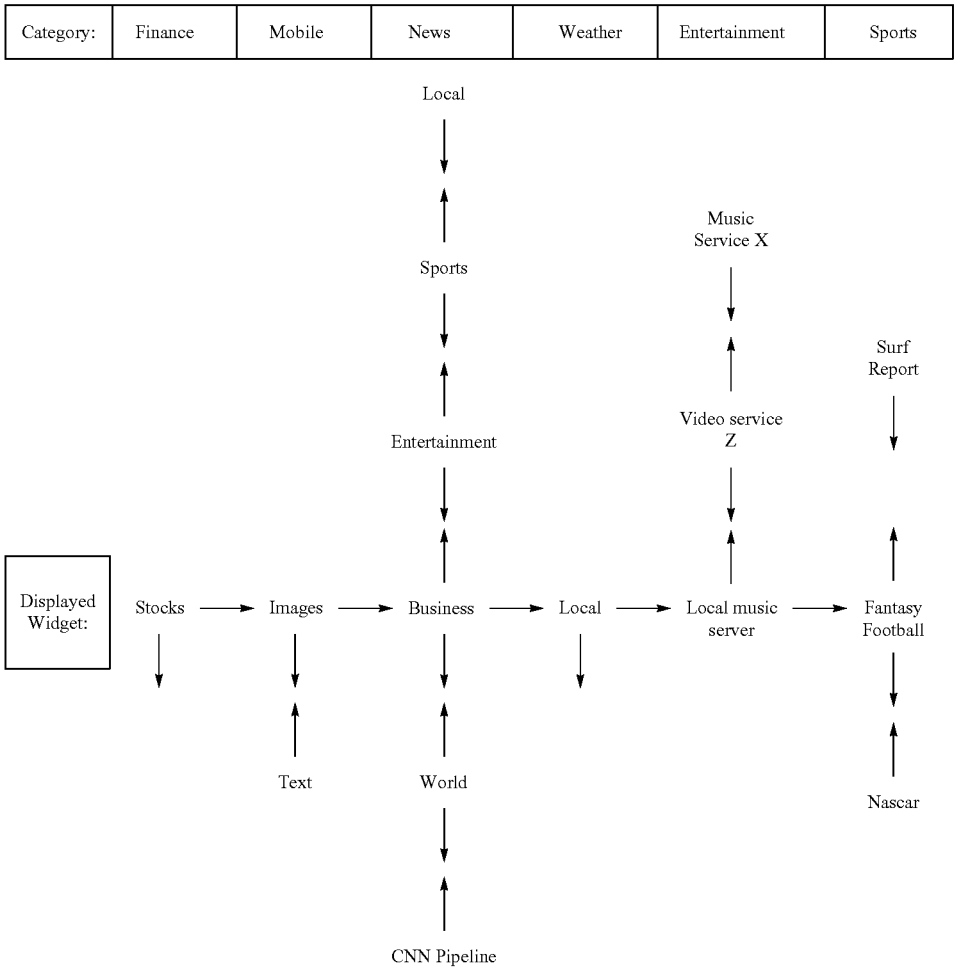
The tabular illustration below provides a conceptual layout of exemplary widget stacks in various categories:



-continued



The following provides a conceptual representation of the case in which the user has navigated into widget stacks for News, Entertainment and Sports:



CHUMBY™ Device Structure

FIGS. **5-6** and **28-29** provide various views of an exemplary CHUMBY™ device in accordance with the present invention. Embodiments of a CHUMBY™ device will typically include one or more assemblies of electronic components integrated into a soft housing. Each such assembly may or may not include components that are externally visible.

In general, the electronics of each assembly are populated onto a printed circuit board, thereby forming a printed circuit board assembly (PCBA). The PCBA is integrated into a hard sub-frame made out of a typically stiff material, such as a

plastic (ABS) or a metal (steel or aluminum). The integration of the sub-frame and PCBA is referred to an "electronics sub-assembly".

Embodiments of the CHUMBY™ device may include one or more electronics sub-assemblies; an exemplary embodiment described herein employs three such sub-assemblies. One such sub-assembly is included within a core electronics unit of the CHUMBY™ device, and contains heat-generating electronics components, an LCD, and a microphone. Another such electronic sub-assembly comprises a WiFi riser containing a WiFi communications module. The third electronics sub-assembly included within the exemplary embodiment of the CHUMBY™ device comprises a "daughtercard sub-assembly". The daughtercard contains a plurality of external connectors (e.g., USB connectors) and a set of audio transducers. In the exemplary embodiment a mechanical switch is grafted onto the daughtercard sub-assembly facilitates the "squeeze sensing" described below. An accelerometer may also be included upon the daughtercard sub-assembly.

The general subdivision into these three sub-assemblies confers several benefits. By confining the heat generating components to the core electronics unit and WiFi riser, a more cost-effective heat path may be engineered. By confining the connectors and large transducers to the daughtercard, logistical advantages may be conferred to the supply chain. This may add a new level of rapid reconfigurability of the CHUMBY™ device for end user customization. By bridging between the sub-assemblies with flexible connectors, the CHUMBY™ device retains a soft and flexible feel.

Attention is now directed to FIG. **5**, which provides various perspective views of an exemplary CHUMBY™ device configured with a malleable housing **502** comprising a rubber-type frame **504** in combination with a fabric material **508**. The housing **502** surrounds a core electronics unit **512**, bezel **514** for daughtercard sub-assembly, and a plush interior fill material (not shown in FIG. **5**). The frame **504**, fabric **508** and fill materials collectively impart a soft and malleable feel to users handling the CHUMBY™ device.

In one embodiment the frame **504** is composed of Santoprene™ or Texin, a soft, flexible, tactile, rubber-like material similar to TPE (thermo plastic elastomer). In another embodiment, the frame **504** is composed of a very low durometer PVC (Polyvinyl Chloride). The exact frame composition will generally balance considerations of flexibility, feel, look, and manufacturing properties, namely, the ability to be sewn and to have items tacked onto the side with adhesive to improve production tolerances. The frame **504** provides structure and form to the housing **502** and allows the core electronics unit **512** to be replaced and inserted. The frame **504** will generally be manufactured in a relatively flattened configuration and then manually flexed or curved and stitched to the fabric or other soft material when assembling the housing **502** of the CHUMBY™ device. In another embodiment, the CHUMBY™ frame, fabric, or a combination thereof is created out of molded EVA (Ethylene Vinyl Acetate) foam. The molding process renders a slightly different feel but generally provides greater fidelity to CAD-related artwork.

FIG. **28** provides an alternative illustration of a CHUMBY™ device in which are identified the core electronics unit **512** and the flexible housing **502**. As opposed to existing wireless or other consumer electronic devices in which the device electronics are typically simply mounted into rigid plastic enclosures that are not subject to any user modification or customization, in an exemplary embodiment the flexible housing of a CHUMBY™ device may be created using any number of exterior fabric materials such as those used in soft-goods or plush toy manufacturing. Such materials may include, for example, leather, suede, Neoprene, rubber, vinyl, etc. Interior to the flexible housing may be contained any number of fill materials, such as Poly-Fil, polyester beads, gel, foam, metal beads, etc., not unlike a pillow, stuffed animal, or plush toy. Such interior fills enable the CHUMBY™ device to be "squishable." Moreover, such interior fill enables the device to retain its shape after being "squeezed" or "pressed" by a user in order to trigger an internal squeeze sensor **650**. (In other embodiments an electric field/capacitance sensor may be used in lieu of a squeeze sensor to detect the location/distance of a user's hand to the sensor; that is, since the user's hand moves closer to the sensor as the user squeezes the flexible housing of the CHUMBY™ device, the sensor is capable of indicating that a "squeeze" event has occurred).

Turning now to FIG. **29**, interior to the flexible housing of an exemplary embodiment of the device there is included the daughtercard circuitry containing an external power switch, external power supply connector, external headphone connector, one or more external USB connectors, internal left and right speaker connectors, internal 9V back-up battery connector **2904**, internal squeeze sensor connector, and internal cable assembly or "Chumbilical™" connector **2910**. In one implementation the Chumbilical connector **2910** is used to connect all the signals received/processed by the daughtercard sub-assembly to the core electronics unit **512** of the CHUMBY™ device, which is press-fit into the soft frame. Also positioned interior to the flexible housing are a pair of speakers **630** (for left and right audio output) (FIG. **6**F), as well as a squeeze sensor **650** (FIG. **6**G) and various cabling required to attach such elements to the daughtercard sub-assembly **640**. In the preferred embodiment, the speakers are affixed to a rigid plate, constructed of plastic or other similar material, located on the back of the CHUMBY™ device, coincident to the headphone connector, USB ports, power switch and power connector.

The division of the circuitry into a core board with greater complexity and cost and a daughtercard which breaks out many of the peripheral connections and features is a significant feature of the design of exemplary embodiments of the CHUMBY™ device. So segregating the design enables quicker adaptation to market and product changes, since the most volatile components of a system are often "on the edge". The segregation of the core and the peripherals in this manner also provides a key benefit, in that the peripheral card can be customized at a lower cost, which helps enable the growth of an ecosystem of accessories and custom housings around the CHUMBY™ device.

Referring to FIGS. **30-31**, an example of a flat pattern, commonly used in soft-goods and garment manufacturing, is used to define the exterior structure of the flexible housing **3002** or "bag" of an exemplary CHUMBY™ device ("CHUMBY™ bag"). Any number of artistic/design elements can be added to the exterior fabric material of the CHUMBY™ bag to add dimension and visual features. The use of a fabric-type enclosure for the CHUMBY™ device provides for unlimited possibilities for product housing creation, both by the original manufacturer and end-users (such as craftspeople, hobbyists, etc.), and is believed to represent a novel approach in the design of consumer electronic and/or wireless devices. Fabric tags, patches, or other fabric/garment-related items can be stitched or otherwise attached to the exterior housing of the CHUMBY™ device to convey product or corporate information, such as a logo.

FIG. **31** provides a sample flat pattern drawing **3100** for the flexible housing **3002** or "bag" of a CHUMBY™ device, showing individual fabric panel shapes, stitching details, and design elements:

FIGS. **6**A-**6**D provide various partially transparent perspective, side and plan views of an embodiment of the CHUMBY™ device. FIGS. **6**E-**6**F depict the core electronics unit and other components contained within the housing of the CHUMBY™ device, and FIG. **6**G illustrates the arrangement of certain of these elements within the housing.

The core electronics unit **512** will generally include, for example, a main circuit board onto which are populated a plurality of electronic components. The main circuit board

will generally then be integrated into a hard sub-frame made of a rigid material such as, for example, stiff plastic or metal, thereby yielding an electronics sub-assembly. The core electronics unit **512** will also typically include an LCD display, touchscreen, ambient light sensor, microphone, USB WiFi dongle **610**, backup battery **620**, and any number of RF shields. This core module is designed to be removable from the frame by the user of the CHUMBY™ device. It is typically connected into the housing CHUMBY™ by the Chumbilical™ connector **2910**.

The WiFi dongle **610** is connected to the WiFi riser (not shown) of the core electronics unit and facilitates WiFi wireless networking.

The backup battery **620** may be realized using, for example, a standard 9V alkaline, and is used to provide backup/supplemental power to the CHUMBY™ device in the event of failure of the primary power supply. In one embodiment, the backup battery **620** is mounted onto an RF shield positioned on a back side of the core electronics unit **512** and is intended to be replaceable by the user. In another embodiment, the battery **620** is contained in the soft housing of the CHUMBY™ device and is accessible via a velcro-sealed hole in the exterior material for user service.

In the exemplary embodiment the daughtercard **640** provides connectors available to the user, including power input, headphone output, and external USB-style connectors for future accessories and/or facilitating device upgrades. The daughtercard sub-assembly **640** is clamped to the fabric in between the daughtercard sub-assembly front and rear bezel components **514**, which are made of rigid ABS-type plastic. The daughtercard sub-assembly connects to the core electronics **512** via the Chumbilical™ **2910**.

In the exemplary embodiment the CHUMBY™ device includes a pair of internally-mounted speakers **630** to provide stereo sound. In one embodiment, the speakers **630** are held in place using square pouches sewn into the interior of the unit. The pouches each have a small drawstring to keep the speakers **630** in a relatively fixed position within the interior of the CHUMBY™ device. In another embodiment, the speakers are retained in the rear bezel molding. Both speakers **630** connect to the daughtercard sub-assembly **640**.

As is discussed below, the squeeze sensor **650** may be implemented in a variety of different ways to facilitate sensing of "squeezing" of the CHUMBY™ device. The squeeze sensor **650** is typically connected to the daughtercard sub-assembly **640** and in one particular embodiment comprises a flexible resistive element which varies in resistance based upon the angle of flex of the sensor. Alternatively, the squeeze sensor **650** may be comprised of a canonical snap action switch with a lever protruding into the body of the CHUMBY™ device and buffered by the surrounding fill material to give an overall soft feel. Accordingly, the squeeze sensor **650** is capable of detecting physical "squeezing" of the soft housing of the CHUMBY™ device. Signals from the squeeze sensor **650** are processed (e.g., by the core electronics module **512** or dedicated electronic circuitry) and generally will precipitate performance a defined action, which may be dependent upon characteristics of the currently active widget. The squeeze sensor **650** connects to the daughtercard sub-assembly **640**. The squeeze sensor **650** will generally be attached to the inside of the CHUMBY™ bag and oriented parallel to the vertical access of the CHUMBY™ device. In other embodiments, one or more displacement sensors may be used to effect the same function.

The squeeze sensor **650** may be implemented in a variety of different forms to accomplish "squeeze sensing" within a CHUMBY™ device:

Mechanical Sensor:

As mentioned above, a mechanical switch, such as a "snap action" switch, may be mounted with its actuator lever curled over so that it does not catch on any of the internal fabric seams. Soft fill may be packed between the lever and the bag surface so as to spread the force of the squeeze around, thereby increasing the effective active area of the snap action switch. Soft fill may also be packed between the lever and the switch so as to provide extra restoring force so that the switch does not become stuck in one position.

Force or Bend Sensitive Sensor:

A strip, such as a resistive bend sensor, or a force sensor consisting of a resistive material, a spacer, and intercalated electrodes, may be adhered or sewn into the fabric. The deformation of the fabric modulates the resistance of these sensors, which could then be post-processed by the electronics in the bag into a bend signal.

Field Sensor:

A capacitive field sensor may be used, which creates a sensing field that extends up to the edge of the bag. When the bag is squeezed, the deformation and presence of the fingers will change the dielectric properties of the air within the bag. This change in dielectric property can be detected using a number of techniques, including but not limited to the shift in frequency of a resonant tank.

Acceleration Sensor:

An accelerometer inside the bag may be used to detect the signature of a deformation event based upon how the sensor moves inside the bag. A set of advanced signal identification primitives may be required, which may take the form of kalman filters, matched filters, and/or hidden markov estimators.

Fabrication of CHUMBY™ Device

As is described hereinafter, a number of process innovations have been developed to address a number of issues pertinent to fabrication of exemplary embodiments of the CHUMBY™ device. For example, challenges exist in ensuring that the soft housing retain each electronics sub-assembly; that is, ensuring that such sub-assemblies remain appropriately positioned within, and do not fall out of, the soft housing of the CHUMBY™ device. In particular, it will generally be desired that the core electronics unit be accessible with a small amount of effort on the part of the end user. A number of methods may be used to ensure a solid mating between the core electronics unit and the soft frame:

First, a plastic lip may be attached to an opening defined by the soft housing in the manner described below. The lip is preferably configured to have a smaller opening than the size of the core electronics sub-assembly. This difference in diameter or relevant dimension prevents the core from easily falling out of the plastic lip.

Second, the soft housing may internally include a set of buttresses that press against the core electronics sub-assembly to keep the housing from being easily pushed inward. The buttresses may take the form of a structural foam or of a rigid mechanical piece attached to the housing.

Third, the lip may have a set of friction-locking points, thus enabling it to engage into the core electronics sub-assembly through mating friction-lock points.

Fourth, the lip and core electronics sub-assembly may be glued together using a variety of adhesives. Using a brittle drying adhesive (such as a cyanoacrylate) allows the seal to be broken with minimal cosmetic impact.

In addition, the lip of the soft housing may be engineered using a soft but semi-tacky plastic, such as TPE, which inherently provides friction.

With respect to mating of the bezel of the daughtercard sub-assembly to the soft housing, it will typically be desired that the sub-assembly be mounted in place without any visible gapping so as to create a "seamless" look with respect to the remainder of the soft housing. A number of methods may be employed to ensure such a seamless mating:

First, an overmolded soft plastic lip (such as a TPE compound) can be applied to the plastic edge of the bezel for the daughtercard sub-assembly to facilitate blending.

Second, a viscous or semi-solid adhesive (such as VHB) can be applied to the daughtercard bezel prior to mounting to assist with minimizing gapping.

Third, a jig-shaped element may be used to hold the bezel component so as to facilitate alignment of the applicable components.

Fourth, a set of screw holes may be made in the fabric of the soft housing in alignment with mating screw-through pegs in the daughtercard bezel to facilitate both alignment and retention of the fabric.

Fifth, a friction-fit rim consisting of an exterior piece sandwiching an interior piece may be used to enhance the snugness of the seam between the soft housing and the daughtercard bezel.

In exemplary embodiments of the CHUMBY™ device a number of approaches may be used during the fabrication process to reduce the buildup of within the soft housing during operation of the CHUMBY™ device. Since in certain embodiment a CHUMBY™ device may gain its shape and resilience due to air trapped between the fibers of a compound similar to polyfill, the fill material and soft housing collectively act as an insulator around the various electronics sub-assemblies. Strategies for mitigating this potential insulating effect are described below.

One heat dissipation strategy involves filling the soft housing of the CHUMBY™ device with thermally-conductive materials. The materials may be dispersed in whole or in part through the soft fill material interposed between the electronics sub-assemblies and the soft housing. Such thermally-conductive materials may be composed of, for example, hollow aluminum beads or pellets, or plastics having relatively good thermal conduction characteristics. Another embodiment uses a thermally-conductive gel material to conduct the heat from the core electronics sub-assembly to the surface of the soft housing. Alternatively, a heat pipe may be used to conduct heat to a metal plate glued to the surface of the soft housing. Such approaches may advantageously leverage a large surface area and utilize relatively thin fabric material for the soft housing so as to minimize overall heat retention.

Heat dissipation may also be facilitated by "stacking" the various electronic sub-assemblies and other components in such a way that a low-thermal resistance path exists from each heat-generating component within the device to one of the solid structures facing exterior to the CHUMBY™ device (e.g., the daughtercard bezel or LCD display). In this embodiment such solid structures effectively function as heats sinks. Each low-thermal resistance path may be completed by interposing a thermal compound (e.g., in the form of soft, gel-like gap filling pads) between the heat generating electronics sub-assemblies and the externally facing solid structure. For example, in one embodiment the LCD display is held in place with an aluminum heat spreader plate, and a thermal compound is applied between the heat spreader and the LCD. In addition, the PCB of the core electronics sub-assembly may contain thermal vias and copper planes to enhance heat flow.

When the WiFi module is mounted directly to the PCB of the core electronics module, heat conduction may be enhanced using positioning a soft gel-like gap filling between the WiFi module to this PCB and ultimately through the LCD display to the ambient air. In another embodiment, the WiFi module is placed on a WiFi riser in order to enable generation of an improved antenna pattern. In this embodiment the WiFi module is positioned such that a suitably low-resistance thermal path is established between the module and the PCB of the core electronics module through any of the metal connectors or devices exposed on the PCB.

Assembling pieces of a soft, flexible material into the soft housing of CHUMBY™ device poses a number of challenges. One exemplary approach involves first sewing the pieces of flexible material inside out and then "turning" the resultant aggregation into its final bag-like configuration for mating (e.g., sewing) to the flexible frame **504**. A number of difficulties which may be potentially encountered during this type manufacturing process and possible resolutions to such difficulties are described below.

Binding of the Flexible Frame to the Sewing Machine—

In one approach a spray-on lubricant may be applied to a back of the flexible frame **504** to prevent binding of the soft housing to the foot of a sewing machine used to attach the soft housing to the frame **504**. Such binding may also be reduced by laminating a piece of smooth paper to the back of the frame **504**. Another process improvement that may be employed in combination with any or all of the above is to use a post-style or anvil-style sewing machine rather than a flatbed machine.

Misalignment Due to Mismatch of Fabric and Plastic Durometer—

As the sewing machine feeds the interface between the frame **504** and the fabric of the soft housing, the fabric will tend to stretch more and faster than the plastic frame **504**. This may be compensated for by pre-distorting the fabric pattern by an amount matching the amount of distortion introduced by the sewing machine feed.

Misalignment Due to Operator Error—

Mismatch of the fabric of the soft housing and the frame **504** may occur due to the compound curves involved in realizing exemplary embodiments of the CHUMBY™ device, thereby making visual alignment difficult. Such mismatch may be reduced by integrating notches, marks, and dots into the plastic frame **504** and flat pattern to act as guides for the operator of the sewing machine.

Fabric Puckering—

Once a seam is created between the frame **504** and the fabric material of the soft housing, the fabric will tend to pucker away from the seam due to the fabric crushing in the vicinity of the seam. This may be compensated for by gluing the fabric onto the frame **504** prior to sewing. The glue acts both as a scaffolding to hold the fabric in place and to prevent the fabric from lifting off the surface of the frame **504**.

Edge Finishing—

It is anticipated that small errors in sewing will tend to be more apparent or otherwise noticeable if the edges of the fabric of the soft housing are rough. This degradation in appearance may be addressed by treating the edges of the fabric to make them appear finished. The specific process employed depends upon the type of fabric material used. For example, in exemplary embodiments which use leather as the fabric material for the soft housing, the edges may be painted. When woven synthetics are used as the fabric material, the edges may first be heat-treated (either with an open flame or a heated metal die). In particular, when using synthetic fabrics for the soft housing a heated metal die may be utilized create a melted emboss pattern around the area of the die used for cutting the fabric. The melted emboss pattern will act to bind the fibers together and create a finished looking edge. For natural fabrics, the edges may be painted, folded under, or have sewing tape applied.

Height Matching—

In exemplary embodiments the plastics or other substances forming the frame **504** are pressed in high-precision molds; in contrast, the fabric materials used for the soft housing are the products of imprecise processes. Mismatch in height between the two can create objectionable visual artifacts. When leather is used as the fabric material, these artifacts may be ameliorated by skiving the leather so as to control its height prior to sewing to the frame **504**. Also, the plastics or other materials used for the frame **504** will generally be molded such that they rise above the height of the finished leather over anticipated manufacturing tolerances. This reduces the visual impact of any imperfections, particularly when the device is viewed from "head-on".

The process of initially integrating multiple pieces of flexible material into the soft prior to attachment to the frame **504**

also poses a number of challenges. One exemplary process pertinent to a soft housing comprised of leather is described below.

First, the soft housing is assembled with the four leather panels, each of which forms one of the sides of the soft housing. When joining these seams, the leather is flipped over, glued, and pounded flat so as to reduce the profile and puckering of the seams when viewed from the front.

The leather has its thickness skived, at least in the area of any seam, so as to reduce puckering in the area of the seam.

The back of the soft housing is attached at the last stage of the process, and then the device is turned inside out.

In another embodiment, the leather seams are given excess length, and the material is sewn back upon itself to create a triple-stitch.

In other embodiments darts may be used to relieve stress around the curved edges of the soft housing. However, the use of darts may adversely affect the aesthetics of the device. Accordingly, in yet another embodiment a modified flat pattern having sufficient tolerance to handle any stresses that build up around such curved edges is utilized.

Due to the stresses that are stored in the flexible frame **504** and fabric housing, exemplary embodiments of the CHUMBY™ device may develop a permanent, asymmetric bias in shape. The following techniques may be applied to limit the impact of these stresses.

First, the effects of friction at the interface between the sewing machine and the materials being sewn may be reduced in the manner described above.

Second, a hot melt may be applied to the frame **504** after the CHUMBY™ device has been assembled. The hot melt is applied on a shaped jig such that the when the hot melt cures it forces the device into a prescribed shape.

A stiffer fabric may be laminated to the back of soft fabrics used in the process. Although not visible from exterior to the CHUMBY™ device, the stiffness allows the natural shape of the fabric (as embodied by the flat pattern) to dominate the forces built into the stitch seams between the frame **504** and the fabric.

Natural fabrics, such as leather, contain defects that can impact the yield of the process. During the die cutting phase, coarser pieces of leather may be cut using the pattern for the bottom and back pieces, so as to lessen the visual impact of these pieces while increasing the overall usage of the leather hide.

The material selection for the frame **504** plays a large role in the manufacturability of the soft housing. The soft frame **504** will preferably comprise a material which is flexible yet does not stretch easily. It will typically be sufficiently soft to permit a sewing needle to penetrate without breaking. One embodiment uses a TPU type of plastic to implement the frame **504**. This type of plastic has the advantage that the soft housing may be attached to using glue, but is relatively hard and sewing needles may have trouble penetrating its surface. Another embodiment uses a TPE type of plastic, which is flexible, does not stretch easily, and may be easily penetrated by a needle. However, it is difficult to induce adherence to the surface of TPE. Another embodiment uses a PVC/PU type of plastic, which is flexible, admits the application of glue, and is soft enough for a needle to easily penetrate.

In another embodiment, an EVA foam is used for both the frame **504** and the fabric of the soft housing, or just for the frame. The EVA may be cast over a mold of the desired size and allowed to set. This process may advantageously produce an integrated frame and flexible housing without sewing, and is capable accurately realizing precise geometries. However, the use of an EVA foam for both the frame and housing of a CHUMBY™ device results in the device exhibiting a stiffer feel than other implementations.

Attention is now directed to the exemplary user interface screens of a CHUMBY™ device shown in FIGS. **32-33**, to which reference will be made in describing a process for calibration of the one or more bend sensors **650** within the device. When a user "squeezes" the back of a CHUMBY™ device and displaces the applicable squeeze sensor **650** beyond the threshold tolerance, the Control Panel function is activated and the appropriate user interface is displayed (FIG. **32**). From a "settings" screen accessed **3220** via the Control Panel **3210** of FIG. **32**, the user can then access the "squeeze" calibration function **3300** (FIG. **33**) to recalibrate the bend sensor.

Although in certain embodiments the flexible or malleable housing of each CHUMBY™ device is intended to be essentially permanent and not replaced, in other embodiments such housings may comprise interchangeable "skins" designed to be easily detached and replaced at the discretion of the user. In such implementations the CHUMBY™ device may be configured to operate in accordance with various profiles depending upon the particular "skin" currently attached to the underlying hardware "core" of the device. Specifically, one or more sensors could be deployed upon the core of the CHUMBY™ device in order to read electronic identifiers embedded within the various skins disposed to be employed as the housing for the CHUMBY™ device. Each identifier could consist of a persistent (non-volatile) storage module containing unique identifying information, and would be physically configured so as to make electrical or radio contact with a corresponding sensor on the core of the CHUMBY™ device upon its skin becoming attached to the device core. The information read from such embedded identifiers could be used to inform the control system of the CHUMBY™ device of the identity of the skin currently enveloping the core of the device. Certain of such skins could, for example, include characteristics or features suggestive of various applications (e.g., "clock radio", or "boom box") or intended operating environments (e.g., "car", "kitchen", "workshop"). In another embodiment, an identifier can be written into non-volatile storage integral to a "skin". When such "skin" is mated to the core, a wired connection is established between the non-volatile storage and the "core" in such a fashion that the identifier can be read directly from such.

Once a new skin has been attached or otherwise secured to the core of a CHUMBY™ device and the information from the embedded identifier has been read, the CHUMBY™ device may send a message to the service provider **106** indicative of its current skin (e.g., "skin #1"). In response, the service provider **106** may reply with a message instructing the CHUMBY™ device to utilize a particular profile (e.g., "profile #3"). It is contemplated that users may elect to define, via a Web browser **122** in communication with the service provider **106**, profiles for each of their skins or simply utilize default profiles available from the service provider **106**. Each profile could define, for example: (i) the widgets to be executed, (ii) the configuration to be used for executing the widgets, and (iii) the style and theme information (color schemes, control decorations, fonts, backgrounds, etc) utilized in presenting information via the LCD display **320**.

CHUMBY™ Service Provider

Referring now to FIG. **7**, a block diagrammatic representation is provided of the server components and other infrastructure which may be utilized to facilitate the operations of the CHUM BY™ service provider **106**. It is understood that the representation of FIG. **7** is functional in nature, and single or multiple computers may be adapted to execute software designed to perform one or more than one of the functions described below. For example, the functionality provided by the load balancers **704** may be provided by a single load balancing device or multiple load balancing devices. Similarly, each of the servers represented in FIG. **7** may be realized using either a single server computer or using a cluster comprised of primary, secondary and backup server computers interconnected in configurations familiar to those skilled in the art.

As shown in FIG. **7**, one or more Web servers **710** are used to define the Web interface presented by the CHUMBY™ service provider **106** to users or other interested parties. A system database **712** may include, among other things, CHUMBY™ user account information, CHUMBY™ device configuration information, CHUMBY™ widget configuration and instance information, marketing materials, press information, and contact information relating to the CHUMBY™ service that is served by the Web servers **710**. Also included may be information relating to registration and first-level support.

A user account server **714** maintains user account data in the system database **712** and provides authentication services to the other servers depicted in FIG. **7**.

One or more widget servers **718** are used to serve widgets to CHUMBY™ devices **102**. Each widget server **718** will typically be sufficiently powerful to encrypt and sign widgets on demand. In addition, each server **718** will be configured to "store-and-forward" widgets being sent from one user to another.

The service provider **106** may also utilize a number of content servers **724** to provide information (e.g., new, weather, stock market information) to CHUMBY™ devices **102**. In an exemplary embodiment all content servers function in a "pull" mode of operation; that is, CHUMBY™ device **102** polls the applicable content server **724** for new data on some periodic basis. Each response from a content server **724** preferably contains the schedule and frequency for subsequent polls. For example, a content server **724** disposed to provide stock market information can change the polling frequency to reflect whether or not the stock market is open. In other implementations a CHUMBY™ device **102** may be provided with the capability to change polling frequencies on the basis of, for example, environmental conditions (e.g., ambient room brightness) or other factors. One or more of the content servers **724** may be used for serving certain types of content uploaded by users for use on their own or other CHUMBY™ devices **102** and stored within the system database **712**.

The CHUMBY™ service provider **106** will typically maintain a small number of load-balanced Network Time Protocol (NTP) servers **730** to provide time to CHUMBY™ devices **102**. Each such server **730** will be configured to fetch their time from a "primary" NTP server, which fetches time from an upstream external public NTP server. If the primary NTP server **730** is inoperative, secondary NTP servers **730** will synchronize with a random selection of upstream servers. If all servers **730** are unavailable, a CHUMBY™ device **102** will either fetch time information from random public NTP servers or simply have its time adjusted via user input. In one embodiment each CHUMBY™ device **102** requests time upon connecting to the Internet and at jittered intervals thereafter, no more frequently than once a day.

Turning now to FIG. **8**, a database model diagram is provided of an exemplary object-oriented database schema **800** utilized by the system database **712**. As shown, the schema **800** includes the following tables: buddies, categories, CHUMBY™ devices, parameters, profiles, skins, users, widget instance, widgets, ratings, registrations, activations, movies, templates, thumbnails. Each rectangular object in FIG. **8** is an entity object representation of a table in the database **712**, with the primary key denoted with the acronym "PK"; ownership relationships indicated by dashed arrows which originate at the owned entity and terminate at the owning entity, and which are keyed by the asterisked column in the owned object; and solid arrows indicating a relationship between entities. Although the type of information contained within a number of these tables will be readily apparent to those skilled in the art in view of the discussion herein, a simplified example of various steps performed during user registration and the adding of a widget to a "profile" is provided in order to further illuminate the structure of the database schema **800**.

In one embodiment the user registration and account creation process is initiated by a user through submission, via a Web browser **122**, of a CHUMBY™ ID so as to identify a particular CHUMBY™ device **102**. The act of creating a user account results in the construction of a default profile and one or more widget instances, each of which is automatically assigned to the CHUMBY™ device **102** (as identified by its CHUMBY™ ID) currently being registered. When a user adds a widget to the user's profile, the user is presented with a list of potential categories based upon information within the categories table. The user then selects a category from the categories table, and the user is presented with a list of widgets belonging to the chosen category. After the user chooses a widget, a widget instance is constructed and information is entered into the appropriate fields (e.g., profile id, widget id, index). The user is then presented a user interface via the Web browser **122** for editing the widget-specific parameters associated with the selected widget. In response to the user's parameter selections, records are appropriately updated in the parameters table.

FIGS. **36**A-**36**H provide a more comprehensive tabular representation of an exemplary object-oriented database schema capable of being utilized by the system database **712**.

System Operation

Client-Server Communication Protocol

In general, it is contemplated that embodiments of the invention will be implemented such that each CHUMBY™ device **102** will function as a client relative to various servers existing within the CHUMBY™ service provider **106**. In these embodiments the CHUMBY™ devices **102** do not engage in direct communication with each other, but may do so via independent client-server relationships established with the service provider **106**. In this way the service provider **106** may facilitate the communication of a variety of different types of executable files (e.g., widgets or other computer programs, audio clips, short "Flash" movies, etc.) among CHUMBY™ devices **102**, subject to the permission of the content owner and potential recipient. A user may designate that a widget or other content be sent to another user, or to the members of a user's "buddy list" or the like. This designation may be made via a Web browser **122** in communication with the service provider **106**, or directly through the interface of the user's CHUMBY™ device **102**.

In one embodiment executable files may be created by users of CHUMBY™ devices **102** or other third parties and loaded within the system database **712** after being approved by the entity operating the service provider **106**. Once a widget or other executable file has been created and stored within the system database **712**, it is made available for use by all those users of CHUMBY™ devices **102** that have been granted the requisite permission. Various schemes for granting permissions among and between users are possible. For example, one such type of permission could entail that any user X that is given permission by a user Y to send widgets to user Y's CHUMBY™ device may select any widget for which user X has usage rights and "send" such widget to user Y's CHUMBY™ device. Other restrictions could be placed on the transferability of widgets or other files from the service provider **106** to a CHUMBY™ device at the request of another user. For example, a user could be provided with the capability to "lock" certain widgets on only the user's CHUMBY™ device, or a CHUMBY™ device could reach a "full" state and advertise itself as being incapable of receiving any additional widgets.

Although widgets and other executable files could be transferred between the service provider **106** and CHUMBY™ devices **102** in a number of different formats, in one embodiment such transfers will occur in the Flash movie format (i.e., as .swf files, when not signed or encrypted). In this case the process for downloading widgets from the service provider **106** includes receiving a notification at a CHUMBY™ device **102** that a "new" widget is ready for downloading. Since in the exemplary embodiment each CHUMBY™ device **102** acts in a "pull" mode, each device **102** periodically polls the service provider and inquires as to whether any configuration changes are available to load. In the case in which a new widget is available for downloading, the CHUMBY™ device **102** will generally use standard HTTP (or HTTPS) protocols in downloading the applicable widget file.

Attention is now directed to FIGS. **9-13**, which are a series of signal flow diagrams representative of the client-server communication protocol established between a CHUMBY™ device **102** and the CHUMBY™ service provider **106**. As mentioned above, each CHUMBY™ device **102** functions as a client relative to the CHUMBY™ service provider **106**. In one embodiment the basic protocol established between each CHUMBY™ device and the corresponding server entity of the CHUMBY™ service provider **106** may be characterized as XML using a Representational State Transfer (REST) architecture transmitted using HTTP. In general, the CHUMBY™ device **102** issues periodic HTTP GET or POST requests and the service provider **106** responds with a block of XML. The CHUMBY™ device **102** will use HTTP GET for relatively simple requests, and POST for more complex requests, which will be in encapsulated in XML. Individual data elements are uniquely identified by Global Unique Identifiers (GUID). In one embodiment, there will be some form of cryptographic key exchange and transactions will be encrypted using those keys. Furthermore, XML may be compressed in order to facilitate transfer between the CHUMBY™ device **102** and the CHUMBY™ service provider **106**.

Each CHUMBY™ device **102** will have a unique GUID. In some embodiments, time codes will be represented in ISO-8061 format.

Requesting a CHUMBY™ Configuration

Referring to FIG. **9**, a signal flow diagram **900** illustratively represents one manner in which a "CHUMBY™ configuration" is provided to a CHUMBY™ device **102** by the service provider **106**. In one embodiment each CHUMBY™ device **102** operates in accordance with a configuration, which specifies the profile to be loaded by the CHUMBY™ device **102** under various conditions. The user specifies the profile for the CHUMBY™ device **102** via a web interface at the CHUMBY™ web site. The profile contains several operational parameters for the CHUMBY™ device **102**.

As shown in FIG. **9**, the requesting of a configuration is initiated when the CHUMBY™ device **102** sends an HTTP GET request containing the GUID of the requested configuration to a CHUMBY™ configuration object within the system database **712** maintained by the service provider **106** (stage **902**). An example of such a request is provided below:

http://server.chumby.com/xml/chumbies/CB6A8A20-DFB8-11DA-98FA-00306555C864

The service provider **106** receives the request (stage **904**), and retrieves the requested configuration from the system database **712** (stage **908**). If the requested configuration exists, the service provider responds with an XML-based configuration; if not, the service provider **106** responds with an XML-based error message (stage **912**). An exemplary XML-based response generated by the service provider **106** is given below:

```
<?xml version="1.0" encoding="UTF-8"?>
<chumby id="CB6A8A20-DFB8-11DA-98FA-00306555C864">
  <name> Bathroom </name>
  <profile href= "/xml/profiles/00000000-0000-0000-0000-000000000001"
name="Default"
  id="00000000-0000-0000-0000-000000000001"/>
  <user username="Frank" href="/xml/users/00000000-0000-0000-0000-
000000000001"
  id="00000000-0000-0000-0000-000000000001"/>
</chumby>
```

Once the response is received by the CHUMBY™ device **102**, it is processed by the Master Controller (stage **916**). If an error is instead received, it is processed by the Master Controller as well (stage **920**).

Requesting a Profile

Referring to FIG. **10**, a signal flow diagram **1000** illustratively represents one manner in which a "profile" is provided to a CHUMBY™ device **102** by the service provider **106**. In one embodiment each CHUMBY™ device **102** operates in accordance with a profile, which specifies the set of widgets to be executed by the CHUMBY™ device **102** under various conditions. This enables a user to specify that a certain subset of the available set of widgets is to be instantiated and utilized during a particular time frame, based upon the location of the user's CHUMBY™ device **102** or the skin (or housing) within which the CHUMBY™ device **102** is currently seated. For instance, the user may desire that local weather and traffic information be provided while the user is located at home, but would prefer that airline flight information be available from the CHUMBY™ device **102** when the user is traveling.

As shown m FIG. **10**, the requesting of a profile is initiated when the CHUMBY™ device **102** sends an HTTP GET request containing the GUID of the requested profile to a profile object within the system database **712** maintained by the service provider **106** (stage **1002**). An example of such a request is provided below:

http://server.chumby.com/xml/profiles/00000000-0000-0000-0000-000000000001

The service provider **106** receives the request (stage **1004**), and retrieves the requested profile from the system database **712** (stage **1008**). If the requested profile exists, the service provider responds with an XML-based profile; if not, the service provider **106** responds with an XML-based error message (stage **1012**). An exemplary XML-based response generated by the service provider **106** is given below:

```
<?xml version="1.0" encoding="UTF-8"?>
<profile id="00000000-0000-0000-0000-000000000001">
  <name>Default</name>
  <description> Default profile for your Chumby</description>
  <user username="chumby" href="/xml/users/00000000-0000-0000-0000-
000000000001"
  id="00000000-0000-0000-0000-000000000001"/>
  <skin href="/xml/skins/00000000-0000-0000-0000-000000000001"
  name="Standard"
  id="00000000-0000-0000-0000-000000000001"/>
```

-continued

```
<access aceess="private" id="EC667B90-EC41-11DA-8774-
00306555C864"/>
<widget_instances>
<widget_instance href="/xml/widgetinstances/B2BE8552-E7F2-11DA-
B4BD-00306555C864"
id="B2BE8552-E7F2-11DA-B4BD-00306555C864"/>
<widget_instance href="/xml/widgetinstances/033BFBC2-E794-11DA-
B4BD-00306555C864"
id="033BFBC2-E794-11DA-B4BD-00306555C864"/>
<widget_instance href="/xml/widgetinstances/94177E18-E777-11DA-
B4BD-00306555C864"
id="94177E18-E777-11DA-B4BD-00306555C864"/>
<widget_instance href="/xml/widgetinstances/9AA50336-E777-11DA-
B4BD-00306555C864"
id="9AA50336-E777-11DA-B4BD-00306555C864"/>
<widget_instance href="/xml/widgetinstances/9E4647F2-E777-11DA-
B4BD-00306555C864"
id="9E4647172-E777-11DA-B4BD-00306555C864"/>
<widget_instance href="/xml/widgetinstances/7AC67832-E77D-11DA-
B4BD-00306555C864"
id="7AC67832-E77D-11DA-B4BD-00306555C864"/>
<widget_instance href="/xml/widgetinstances/B4C35F06-E777-11DA-
94BD-00306555C864"
id="B4C35F06-E777-11DA-848D00306555C864"/>
<widget_instance href="/xml/widgetinstances/5D81823A-E77D-
11DA-
B4BD-00306555C864"
id="5D81823A-E77D-11DA-B4BD-00306555C864"/>
</widget_instances>
<buddies_of>
<buddy profile="A9BF0AC6-07DB-11DC-A700-0017F2D98B02"
name="fredgarvin"
profilename="Default" id="9790F788-07DB-11DC-A700-
0017F2D98B02"/>
</buddies_of>
</profile>
```

Once the response is received by the CHUMBY™ device **102**, it is processed by the Master Controller (stage **916**). If an error is instead received, it is processed by the Master Controller as well (stage **920**).

Each Profile has a name, a description, a skin, and a list of "Widget Instances". The Profile will be periodically refetched in order to reflect changes made by the owner, for instance, adding and removing Widget Instances. The Profile may also contain a "buddies_of" node, which contains information about users and profiles that have indicated the owner of the Profile to be a "buddy" in order to facilitate the sending of widget instances.

The CHUMBY™ device **102** processes each Widget Instance in turn, fetching the settings for each widget, and the Widget itself, and displays the Widget with the settings encapsulated by the Widget Instance.

A process similar to that described with reference to FIG. **9** may be used to change a profile. An example of an HTTP POST containing an the GUID of the profile to modify and an XML-based request to change a profile generated by the CHUMBY™ device **102** is given below:

```
http://server.chumby.corn/xml/profiles/00000000-0000-0000-0000-
000000000001
<?xml version="1.0" encoding="UTF-8"?>
<profile id="00000000-0000-0000-0000-000000000001">
<name>Default</name>
<description> Default profile for your Chumby</description>
<user username="chumby" href="/xml/users/00000000-0000-0000-0000-
000000000001"
id="00000000-0000-0000-0000-000000000001"/>
<skin href="/xml/skins/00000000-0000-0000-0000-000000000001"
name="Standard"
id="00000000-0000-0000-0000-000000000001"/>
<access access="private" id="EC667B90-EC41-11DA-8774-
00306555C864"/>
<widget_instances>
<widget_instance href="/xml/widgetinstances/B2BE8552-E7F2-11DA-
B4BD-00306555C864"
id="B2BE8552-E7F2-11DA-B4BD-00306555C864"/>
<widget _instance href="/xml/widgetinstances/033BF8C2-E794-11DA-
B4BD-00306555C864"
id="033BFBC2-E794-11DA-B4BD-00306555C864"/>
<widget_instance href="/xml/widgetinstances/94177E18-E777-11DA-
B4BD-003065550864"
id="94177E18-E777-11DA-B4BD-00306555C864"/>
<widget_instance href="/xml/widgetinstances/9AA50336-E777-11DA-
B4BD-00306555C864"
id="9AA50336-E777-11DA-B4BD-00306555C864"/>
<widget_instance href="/xml/widgetinstances/9E4647F2-E777-11DA-
B4BD-00306555C864"
id="9E4647F2-E777-11DA-B4BD-003065550864"/>
<widget_instance href="/xml/widgetinstances/7AC67832-E77D-11DA-
B4BD-00306555C864"
id="7AC67832-E77D-11DA-B4BD-003065550864"/>
<widget_instance href="/xml/widgetinstances/B4C35F06-E777-11DA-
B4BD-00306555C864"
id="B4C35F06-E777-11DA-B4BD-003065550864"/>
<widget_ instance href="/xml/widgetinstances/10A66395-8500-215E-
81F0-003256F98257"
id="10A66395-8500-215E-81F0-003256F98257"/>
</widget_instances>
</profile>
```

An exemplary XML-based response corresponding to such a request which contains the updated profile could be provided by the service provider **106** as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<profile id="00000000-0000-0000-0000-000000000001">
  <name>Default</name>
  <description> Default profile for your Chumby</description>
  <user username="chumby" href="/xml/users/00000000-0000-0000-0000-
  000000000001"
  id="00000000-0000-0000-0000-00000000000138 />
  <skin href="/xml/skins/00000000-0000-0000-0000-00000000001"
  name="Standard"
  id="00000000-0000-0000-0000-000000000001"/>
  <access access="private" id="EC667B90-EC41-11DA-8774-
  00306555C864"/>
  <widget_instances>
    <widget_instance href="/xml/widgetinstances/B2BE8552-E7F2-11DA-
    B4BD-00306555C864"
    id="B2BE8552-E7F2-11DA-B4BD-00306555C864"/>
    <widget_instance href="/xml/widgetinstances/033BFBC2-E794-11DA-
    B4BD-00306555C864"
    id="033BFBC2-E794-11DA-B4BD-00306555C864"/>
    <widget_instance href="/xml/widgetinstances/94177E18-E777-11DA-
    B4BD-00306555C864"
    id="94177E18-E777-11DA-B4BD-003065550864"/>
    <widget_instance href="/xml/widgetinstances/9AA50336-E777-11DA-
    B4BD-00306555C864"
    id="9AA50336-E777-11DA-B4BD-003065550864"/>
    <widget_ instance href="/xml/widgetinstances/9E4647F2-E777- 11DA-
    B4BD-00306555C864"
    id="9E4647F2-E777-11DA-B4BD-00306555C864"/>
    <widget_ instance href="/xml/widgetinstances/7AC67832-E77D-11DA-
    B4BD-00306555C864"
    id="7AC67832-E77D-11DA-B4BD-00306555C864"/>
    <widget_ instance href="/xml/widgetinstatices/B4C351706-E777-11DA-
    B4BD-00306555C864"
    id="B4C35F06-E777-11DA-B4BD-00306555C864"/>
    <widget_ instance href="/xml/widgetinstances/10A66395-8500-215E-
    81F0-003256F98257"
    id="10A66395-8500-215E-81F0-003256F98257"/>
  </widget_ instances>
</profile>
```

Widget Instance Upload/Download

Turning now to FIGS. **11-12**, there are shown signal flow diagrams representative of the communication of widget instance information from the CHUMBY™ device **102** to the service provider **106**, and vice-versa. In one embodiment the set of parameters associated with a widget instance determine the user-specified manner in which the behavior of the widget is modified when executed by a CHUMBY™ device **102**. That is, the parameters fetched by the CHUMBY™ device **102** from the service provider **106** for a given widget constitute the user's "customized" settings, rather than dynamic content. For example, in the case of a "stock ticker" widget the applicable parameters could comprise the names and symbols of the stocks within the user's portfolios, but would not define or relate to the current prices of the stocks (which would be furnished by another service supplied by the service provider **106**).

FIG. **11** is a signal flow diagram which depicts processing of changes made to the parameters of a widget instance through the interface of the CHUMBY™ device **102** in which the widget is instantiated. Examples of parameter changes could include changing a location of interest in the case of a "weather" widget, or adding/removing stock ticker symbols in the case of a "stock market" widget. In the exemplary embodiment it is not necessary for the user to set or otherwise modify all parameters of a given widget, and the service provider **106** will effectively "expand" the parameter change data into a full parameter record once received. For instance, a zip code could be sufficient to uniquely identify a location in the case of a weather widget, and the associated city, state, etc. could be supplied to the applicable record during processing of the parameter change request by the service provider **106**.

As shown, the widget instance change operation is initiated when the CHUMBY™ device **102** sends an HTTP POST and an XML request to a widget instance object within the system database **712** maintained by the service provider **106** (stage **1102**). This type of "UPLOAD" operation informs the service **106** that the parameters of a specific widget instance have been updated by the applicable user. As shown, the updated parameters are received by the service provider (stage **1104**), and are attempted to be written to a corresponding widget instance object within the system database **712** (stage **1108**). If this attempted write operation is unsuccessful (stage **1112**), the service provider **106** responds with an error message that is processed by the requesting CHUMBY™ device **102** (stage **1120**). If the write operation is successful, the newly updated widget instance are retrieved from the system database **712** (stage **1116**) and sent to the applicable CHUMBY™ device **102** (stage **1120**).

Once received, the widget instance is processed by the CHUMBY™ device **102** (stage **1124**). In general, the processing of the parameters contained in a widget instance are dependent upon the characteristics of the particular widget. In certain cases the parameters may be sufficient to enable the widget to display information, while other widgets may use the parameters to fetch content from another service. As an example of the former, consider a "clock" widget capable of displaying information following receipt of a parameter indicating a time zone. In contrast, a "stock widget" may have stock symbols as parameters and use such symbols to fetch quote information.

Referring now to FIG. **12**, there is shown a signal flow diagram illustrating an exemplary widget instance download

operation in which the service provider **106** is requested to push values of widget-specific parameters to a requesting CHUMBY™ device **102**. The requesting of a parameter download is initiated when the CHUMBY™ device **102** sends an HTTP GET containing the GUID of the requested widget instance request to a parameter object within the system database **712** maintained by the service provider **106** (stage **1202**). An example of such a request in the case of a "weather" widget is provided below:

http://server.chumby.com/xml/widgetinstances/5D81823A-E77D-11DA-B4BD-00306555C864

The service provider **106** receives the request (stage **1204**), and retrieves the requested parameters from the system database **712** (stage **1208**). If the requested parameters exist, the service provider **106** responds with an XML-based widget instance message (stage **1212**). Using the example of a weather widget, which utilizes a zip code to identify the location for which weather is to be retrieved, such a message could comprise:

```
<?xml version="1.0" encoding="UTF-8"?>
<widget_ instance id="5D81823A-E77D-11DA-B4BD-00306555C864">
  <widget href="/xml/widgets/BF4CE814-DFB8-11DA-9C82-
  00306555C864" id="BF4CE814-
  DFB8-11DA-9C82-003065550864"/>
  <profile href="/xml/profiles/00000000-0000-0000-0000-000000000001"
  id="00000000-0000-0000-
  0000-000000000001"/>
  <access access="private"/>
  <mode time="10" mode="timeout"/>
  <received buddy="9790F788-07DB- 11DC-A700-0017F2D98B02"
  forward=" true"
  accepted="false"/>
  <widget_parameters>
    <widget_parameter id="BF4CE814-DFB8-11DA-9C82-
    00306643C864">
      <name>ZipCode</name>
      <value>92037 </name>
    </widget_parameter>
  </widget_parameters>
</widget_instance>
```

The CHUMBY™ device **102** uses the GUID in the "widget" tag to fetch the information about the Widget to be displayed. Once the widget has been started, it is passed the name/value pairs in the "widget parameters" section, in order to customize the behavior of the widget. The "mode" tag indicates how long the widget is to be played. A value of "default" in the mode attribute indicates that the timing will be specified by the widget description, an attribute value of "timeout" will use the duration specified in the "time" attribute (in seconds), and the value of "cooperative" will display the widget until the user explicitly commands it to stop through a UI element, or the widget itself indicates that it wishes to discontinue operation. The presence of a "received" node indicates that the widget instance has been "sent" by a buddy. The value of the "accepted" attribute indicates whether or not the widget instance has been accepted by the recipient, which is done either through the web interface or through the UI of the device. The "forward" attribute indicates whether this widget instance can be sent on to another user.

If the requested parameters do not exist, a default widget instance is attempted to be retrieved from the system database **712** (stage **1224**). If such a widget instance exists (stage **1228**), the service provider **106** responds with an XML-based parameters message that is processed by the CHUMBY™ device **102** upon receipt (stage **1220**). If such a default widget instance does not exist, an error message is returned to the CHUMBY™ device **102** (stage **1232**).

Downloading a Widget

Referring now to FIG. **27**, a signal flow diagram **2700** is provided which illustratively represents the process of downloading the code for a widget (e.g., a .swf file) from the service provider **106** for execution on a CHUMBY™ device **102**. The process is initiated when the CHUMBY™ device **102** sends an HTTP GET request containing the GUID of the requested widget to a specific widget description object within the system database **712** maintained by the service provider **106** (stage **1302**). An example of such a request is provided below:

http://server.chumby.com/xml/widgets/BF4CE814-DFB8-11DA-9C82-00306555C864

The service provider **106** receives the request (stage **2704**), and attempts to retrieve the requested widget description from the system database **712** or other data source available to the service provider **106** (stage **2708**). If the requested widget description is able to be retrieved, the service provider **106** responds with an XML-based widget description message; if not, the service provider **106** responds with an XML-based error message (stage **2712**). An exemplary XML-based response generated by the service provider **106** is given below:

```
<?xml version="1.0" encoding="UTF-8"?>
<widget id="BF4CE814-DFB8-11DA-9C82-00306555C864">
  <name> Time Zones</name>
  <description> A time zone selector</description>
  <version>1.0</version>
  <protection protection="none"/>
  <mode time="15" mode="default"/>
  <access sendable="true" deleteable="true" access="public"
  virtualable="true"/>
  <user username="chumby" href="/xml/users/00000000-0000-0000-0000-
  000000000001"
  id="00000000-0000-0000-0000-000000000001"/>
  <category href="/xml/categories/00000000-0000-0000-0000-
  000000000001" name="Chumby"
  id=00000000-0000-0000-0000-000000000001"/>
  <thumbnail contenttype="image/jpeg" href="/xml/thumbnails/
BF4CE814-
  DFB8-11DA-9C82-003065550864"/>
  <template contenttype="text/xml" href="/xml/templates/BF4CE814-
  DFB8-11DA-9C82-003065550864"/>
  <movie contenttype="application/x-shockwave-flash"
  href="/xml/movies/BF4CE814-DFB8-11DA-9C82-00306555C864"/>
  <rating count="0" rating="0.0"/>
</widget>
```

Once the requested widget description is received by the CHUMBY™ device **102**, the CHUMBY™ device **102** uses the URL referencing the "movie" for the requested widget to download the movie (e.g., .swf) file from the service provider **106**. The CHUMBY™ device **102** sends an HTTP GET request containing the GUID of the requested movie to a specific movie object within the system database **712** maintained by the service provider **106** (stage **1320**). An example of such a request is provided below:

http://server.chumby.com/xml/movies/BF4CE814-DFB8-11DA-9C82-00306555C864

The service provider **106** receives the request (stage **2724**), and attempts to retrieve the requested movie from the system database **712** or other data source available to the service provider **106** (stage **2728**). If the requested movie is able to be retrieved, the service provider **106** responds with the .swf file which implements the movie; if not, the service provider **106** responds with an XML-based error message (stage **2732**). Once the requested movie is received by the CHUMBY™ device **102**, it is loaded by the Master Controller and queued for subsequent execution (stage **2736**). If an error is instead received, it is processed accordingly (stage **2740**).

Requesting Content

Referring now to FIG. **13**, a signal flow diagram **1300** is provided which illustratively represents the process of obtaining content from the service provider **106** for a widget of a CHUMBY™ device **102**. The process is initiated when the

CHUMBY™ device **102** sends an HTTP GET and an optional XML request to a specific content object within the system database **712** maintained by the service provider **106** (stage **1302**). An example of such a request for content for a "tide" widget is provided below:

http://content.chumby.com/tides/United%20States/National%20City%2C%20San%20Diego%20Bay-%2C%20California

The service provider **106** receives the request (stage **1304**), and attempts to retrieve the requested content from the system database **712**, internal content service, external content service or other data source available to the service provider **106** (stage **1308**). If the requested content is able to be retrieved, the service provider **106** responds with an XML-based content message; if not, the service provider **106** responds with an XML-based error message (stage **1312**). Once the requested content is received by the CHUMBY™ device **102**, corresponding audiovisual output is generated by the device **102** for the benefit of its user (stage **1316**). If an error is instead received, it is processed accordingly (stage **1320**). An exemplary XML-based response generated by the service provider **106** is given below:

```
<tide items>
  <tideitem timestamp="2006-05-31T00:39:11Z">
    <location>
      <locationstring string="National City, San Diego Bay, California"/>
      <station id="National City, San Diego Bay"/>
      <state name="California"/>
      <country name="United States"/>
      <coordinates lat="32.6667 Â°N", lon="117.1167Â°W"/>
    </location>
    <tides>
      <tide dateTime='2006-05-31T12:44:00Z', tidedescription="Low Tide",
      tidelevel="0.85 meters"/>
      <tide dateTime='2006-05-31T02:50:00Z', tidedescription="Sunset"/>
      <tide dateTime='2006-05-31T06:30:00Z', tidedescription="Moonset"/>
      <tide dateTime='2006-05-31T06:56:00Z', tidedescription="High Tide",
      tidelevel=" 1.80 meters"/>
      <tide dateTime='2006-05-31T24:41:00Z', tidedeseription="Sunrise"/>
      <tide dateTime='2006-05-31T14:46:00Z', tidedeseription="Low Tide",
      tidelevel="-0.13 meters"/>
      <tide dateTime='2006-05-31T16:38:00Z',
      tidedescription="Moonrise"/>
      <tide dateTime='2006-05-31T21:55:00Z', tidedeseription="High Tide",
      tidelevel="1.14 meters"/>
      <tide dateTime='2006-06-01T01:38:00Z', tidedescription="Low Tide",
      tidelevel="0.92 meters"/>
      <tide dateTime='2006-06-01T02:50:00Z', tidedescription="Sunset"/>
      <tide dateTime='2006-06-01T07:06:00Z', tidedeseription="Moonset"/>
      <tide dateTime='2006-06-01T07:41:00Z', tidedescription="High Tide",
      tidelevel="1.64 meters"/>
      <tide dateTime='2006-06-01124:41:00Z', tidedescription="Sunrise"/>
      <tide dateTime='2006-06-01T15:37:00Z', tidedeseription="Low Tide",
      tidelevel="-0.01 meters"/>
      <tide dateTime='2006-06-01T17:38:00Z',
      tidedescription="Moonrise"/>
      <tide dateTime='2006-06-01T22:59:00Z', tidedescription="High Tide",
      tidelevel="1.18 meters"/>
      <tide dateTime='2006-06-02T02:51:00Z', tidedescription="Sunset"/>
      <tide dateTime='2006-06-02T02:58:00Z', tidedescription="Low Tide",
      tidelevel="0.96 meters"/>
      <tide dateTime='2006-06-02T07:37:00Z', tidedeseription="Moonset"/>
      <tide dateTime='2006-06-02T08:35:00Z', tidedescription="High Tide",
      tidelevel="1.4 7 meters"/>
      <tide dateTime='2006-06-02T24:41:00Z', tidedescription="Sunrise"/>
      <tide dateTime='2006-06-02T16:28:00Z', tidedescription="Low Tide",
      tidelevel="0.09 meters"/>
      <tide dateTime='2006-06-02T18:35:00Z',
      tidedescription="Moonrise"/>
      <tide dateTime='2006-06-02T23:51:00Z', tidedescription="High Tide",
      tide level="1.26 meters"/>
      <tide dateTime='2006-06-03T02:51:00Z', tidedescription="Sunset"/>
      <tide dateTime=6'2006-06-03T04:44:00Z', tidedescription="Low Tide",
      tidelevel="0.93 meters"/>
      <tide dateTime='2006-06-03T08:04:00Z', tidedescription="Moonset"/>
      <tide dateTime='2006-06-03T09:46:00Z', tidedescription="High Tide",
      tidelevel="1.31 meters"/>
      <tide dateTime='2006-06-03T24:41:00Z', tidedescription="Sunrise"/>
      <tide dateTime='2006-06-03T17:17:00Z', tidedeseription="Low Tide",
      tidelevel="0.19 meters"/>
      <tide dateTime='2006-06-03T19:31:00Z',
      tidedescription="Moonrise"/>
      <tide dateTime='2006-06-03T23:06:00Z', tidedescription="First
      Quarter"/>
      <tide dateTime='2006-06-04T12:30:00Z', tidedescription="High Tide",
      tidelevel="1.35 meters"/>
    </tides>
  </tide item>
</tideitems>
```

In the case where content is retrieved directly from an external content service provider (i.e., from other than the service provider **106**), a series of web-based transactions (most likely HTTP and/or XML-based) defined by such content service provider will take place between the CHUMBY™ device **102** and such provider.

CHUMBY™ Security Protocol

CHUMBY™ devices **102** may optionally include a hardware security module, which in one implementation is accessed via a character driver interface in the operating system ("OS") of the device **102**. The module may or may not be installed. When the module is not installed, the OS preferably virtualizes the hardware security module by emulating it in software. While losing all the tamper-resistance benefits of a hardware module, this feature enables cost reduction savings while maintaining protocol interoperability with a secured system.

The hardware security module of a CHUMBY™ device **102** may be implemented in a number of ways. As an example, the hardware security module may be implemented using a monolithic security processor or a cryptographic Smart Card module. This module, or its emulated counterpart, is capable of at a minimum, the following operations: (1) storage of secret numbers in hardware; (2) the ability to compute public-key signatures; (3) the ability to compute one-way cryptographic hashes; and (4) the ability to generate trusted random numbers.

During the manufacturing process the hardware security module, or its emulated counterpart, is initialized with a set of secret numbers that are only known to the module and to the CHUMBY™ service provider **106**. These secret numbers may or may not consist of public and private keys. If the numbers consist of public and private keys, then a mutual key-pair is stored by both the CHUMBY™ service provider **106** and the hardware module, along with a putative, insecure identifier number for the pair. Furthermore, these numbers are preferably not recorded by the CHUMBY™ service provider **106** in association with any other identifying information, such as the MAC address for the WLAN interface, or any other serial numbers that are stored in insecure memory for customer service purposes.

When the user or service wishes to initiate a strong authenticated transaction, the CHUMBY™ device **102** sends the putative insecure key-pair identifier to the service provider **106**. The service provider **106** looks up the putative insecure key-pair identifier and issues a challenge to the hardware module, consisting of a random number In particular, the challenge is packetized and sent through the Internet to the CHUMBY™ device **102**. The device **102** unpacks the challenge and passes it directly to the hardware module. The hardware module adds another random number to the packet and signs the pair of numbers, along with other transaction information (such as the version number of the protocol) with a private key that is only known to the CHUMBY cryptoprocessor. In addition, an "owner key" may optionally be encrypted to the server public key. Again, this message is packetized and transmitted by the device **102** to the service provider **106** over the Internet. Upon receipt, the service provider **106** verifies the signature of the packet using the device's public key, which was generated and recorded at the time of manufacture and indexed by the hash of the putative insecure key-pair identifier. The CHUMBY device is deemed authentic if the signature is correct and the signed packet contains the exact random number that was generated by the service provider in the first step of the challenge. The service provide **106** also decrypts the owner key, whose purpose is discussed in the next paragraph. At the conclusion of this transaction, the service provider **106** has authenticated the device **102**, and can fall back to any number of session keys that can be either dynamically generated or statically stored for further secured transactions. Advantageously, this authentication transaction does not involve uniquely associating the hardware module with user information. Rather, the service provider **106** is simply aware of the existence of the approved hardware module and upon completion of the authentication transaction may safely trust the integrity of the secrets stored therein.

The owner key comprises a random number (or one of a set of random numbers) generated at the time of manufacture and stored only within the cryptographic processor. The owner key is transmitted to the server, encrypted using the server public key, and used as a shared secret to protect any other secrets (user passwords, credit card information, etc.) that may be stored on the server. Once a user decides they no longer wish to continue with the service, or desire to sell or transfer their CHUMBY™ device, or otherwise wish to revoke any secrets entrusted to the server, the user can instruct the cryptographic processor to delete the key from memory, thereby abolishing the server's ability to decrypt the secrets entrusted to it.

A user of the device **102** may opt-out of privacy mode and provide identifying information, as required by some billing services such as credit cards and banks. Optionally, an anonymous cash-based transaction network can be established where accounts are opened and managed only by secrets contained within the hardware module.

To enable limited revocation of user-identifying information, the specific embodiment of the master authentication protocol should operate on a set of clean-room servers with a multiplicity of connections that are trusted by the CHUMBY™ service provider **106**, and authenticated session keys are then passed on laterally to the content servers. Thus, the anonymity of the master authentication key is nominally preserved, although it is possible to recreate and correlate transactions from forensic logs and transaction timings. The use of multiple servers and multiple connections, along with network routing randomization techniques, can be used to increase the anonymization resistance to forensic logging (cf. Tor network), but this configuration is in no way essential to the network's operation.

CHUMBY™ Device Calibration, Registration and Account Management

Attention is now directed to FIGS. **14-21**, which are a set of flowcharts representative of the calibration, registration and initial operation of a CHUMBY™ device and associated account management functions.

Initial Power-Up

FIG. **14** is a flowchart **1400** which depicts an exemplary sequence of operations performed by a CHUMBY™ device **102** upon initial power-up. When a user initially connects a CHUMBY™ device **102** to a power source, the device **102** undergoes a touchscreen calibration process described below with reference to FIGS. **15-16** (stage **1404**). The device **102** then selects a wireless base station in the manner described below with reference to FIG. **17** (stage **1408**). If a proxy server is identified (stage **1412**), then information relating to the proxy server is configured into the CHUMBY™ device **102** to enable it to with the Web site maintained by the service provider **106** (as well as with the Web sites of content providers) (stage **1416**). At this point the user of the CHUMBY™ device **102** is prompted to set the time zone in which the device **102** is located (stage **1420**). If an NTP server is determined to be available (stage **1430**), then time is set automatically based upon information acquired from such a server (stage **1440**). If not, the CHUMBY™ device **102** is referenced to a time set manually (stage **1444**). After the time of

the CHUMBY™ device **102** has been set, the registration process described below with reference to FIG. **18** is initiated (stage **1450**).

In one embodiment a CHUMBY™ device downloads configuration information from the service provider **106** each time it is powered on or otherwise re-establishes communication with the service provider **106**. However, a minimal amount of widget and configuration information may be locally stored on a CHUMBY™ device so that it may continue to function in the absence of network connectivity. For example, a clock widget may be permanently stored on a CHUMBY™ device so that its clock function could remain operational at all times. A CHUMBY™ device will typically include sufficient memory capacity to hold configuration information received from the service provider **106** for all of the widgets to be executed by the device, up to some reasonable number of widgets. If a user changes the configuration for a CHUMBY™ device through the Web site maintained by the service provider **106**, a polling function implemented on the corresponding CHUMBY™ device will typically be used to "pull" the modified configuration information from the service provider **106**. Alternatively, an operation may be manually initiated via the interface of the corresponding CHUMBY™ device in order to obtain this information (e.g., an "Update My CHUMBY™ Device Now" operation).

Touchscreen Calibration

Turning now to FIG. **15**, there is shown a flowchart which illustrates an exemplary routine used to calibrate the touchscreen of a CHUMBY™ device **102**. FIGS. **16**A-**16**E provide a set of screen shots of the user interface of the CHUMBY™ device **102** being calibrated pursuant to the routine of FIG. **15**. As shown, the calibration routine involves determining an upper left set point (stage **1502**). This set point is determined by generating a target **1602** (FIG. **16**A) through the LCD screen **320** which the user is then prompted to tap. A lower right set point is then determined by prompting the user to tap a target **1604** depicted in FIG. **16**D (stage **1506**). After the lower right set point target **1604** has been tapped, the user is instructed to test the touch screen calibration (stage **1510**) by dragging the ball **1605** depicted in FIG. **16**C from ring A **1606** to ring B **1607**. Once the ball **1605** has been successfully placed in ring B **1607**, a notification of success **1608** as depicted in FIG. **16**D will be displayed and done button **1609** will be activated. Once the done button **1609** has been pressed, the results of the calibration process are then stored (stage **1514**). Based upon the coordinate data received from the touchscreen **330** during each of stages **1502** and **1506**, the CPU **302** executes a program to generate calibration information used during subsequent operation of the device **102**.

Wireless Base Station Selection

FIG. **17** is a flowchart illustrating the operations performed in selecting a wireless base station upon initial power-up of the device **102**. As shown, the Wi-Fi communications interface **314** of the device initially searches for one or more access points **210** emitting a beacon signal (stage **1702**). If the device is configured to search for access points not emitting a beacon signal (stage **1706**), then a keyboard is accessed (stage **1710**) and data designating an access point is entered (stage **1714**). The keyboard may comprise a physical keyboard connected to the device **102** as a peripheral component. Alternatively, an "onscreen" keyboard generated by the LCD screen **320** and interacted with via the touchscreen **330** may be utilized. Once data designating an access point has been entered, a subsequent scan (stage **1715**) will be initiated in an attempt to find the access point that was not emitting a beacon signal. Once one or more wireless networks have been discovered, the user is given the option to select one from a list (stage **1717**). When a wireless network is selected, the CPU **302** executes a program to determine various aspects of the chosen wireless network (stage **1718**), including but not limited to authentication mode, encryption type, channel/frequency, etc. If a suitable network is not detected, the user may be given the choice to enter the network configuration properties (e.g. SSID, authentication mode, etc) manually (stage **1730**). If the user chooses to manually enter network properties, a keyboard (stage **1710**) is displayed and the user is prompted to enter the network properties (stage **1731**). If the selected or designated network requires authentication (e.g. WPA, WPA2, etc) and/or or is otherwise encrypted (e.g., WEP, AES, TKIP, etc), a keyboard (stage **1710**) is displayed and the user is given the opportunity to enter the applicable key (stage **1720**). In the event that a user enters a WEP key, the key size will be determined automatically by the length of the key entered by the user. The user is then presented with a choice of automatic or manual IP allocation (stage **1732**). Should the user select a manual IP allocation, a keyboard (stage **1710**) is displayed and the user is prompted to enter IP related configuration data (stage **1733**) such as IP address, netmask, gateway, nameservers, etc. After the IP allocation method has been chosen and optionally configured, the user will be asked to confirm the network settings (stage **1735**). A connection is then attempted to be established with a detected or designated access point (stage **1740**). If a connection is so established (stage **1750**), then the information relating to the connection is stored within the memory of the device **102** (stage **1755**); otherwise the user is given the option to reattempt to establish the connection.

Registration

Referring now to FIG. **18**, a flowchart is provided of an exemplary account creation and registration process **1450**. The process begins upon presentation by the device, via its LCD screen **320**, of its serial number or other identifying information (stage **1802**). The user then logs in, via a Web browser **122**, to a web site operated by the service provider **106** (e.g., www.chumby.com) (stage **1804**). In one embodiment the user may then select a "create new user account" tab or the like (stage **1808**), and is prompted to enter an email address (stage **1810**), password (stage **1812**), and name (stage **1816**). In certain implementations the user may also be offered the opportunity to enter his or her address (stage **1820**), while in other implementations the user is not prompted to provide an address until this information is required for some particular purpose (e.g., to provide a billing information for a subscription or shipping information for a product purchase). If this option is selected, the user enters his or her address (stage **1824**). In certain implementations, the user may be prompted to provide other identifying and/or demographic information (not shown in this figure). At this point the service provider **106** sends an email to the address entered in stage **1810** which contains a "click through" account activation hyperlink (stage **1830**). If the user does not receive this message (stage **1834**), the user is provided with the opportunity to take advantage of various customer service options in order to remedy the account creation difficulties being experienced (stages **1840**-**1841**). In any event, the account creation process is then finalized (stage **1850**), and the CHUMBY™ device being registered is associated within the system database **712** with a particular user account in the manner described below (stage **1854**). Once this has occurred a default configuration and a number of widget instances are established for the newly registered CHUMBY™ device (stage **1860**).

Account Association

FIG. **19** is a flowchart representative of exemplary Web-based interaction occurring between a user and the service provider **106** in connection with associating a particular CHUMBY™ device with the user's account. The process is initiated when the user logs in to a Web site operated by the service provider **106** (stage **1902**) and selects an "Activate a CHUMBY™" link or the equivalent (stage **1904**). The user enters a name of the CHUMBY™ device (e.g., bedroom, study, Fred, evening, etc.) (stage **1908**) and then, as described in the above-referenced co-pending U.S. Provisional Application Ser. No. 60/945,900, the user duplicates the "captcha

grid" pattern displayed on the "Activate a CHUMBY™" page on the corresponding "Activate CHUMBY™" screen on the CHUMBY™ device and selects "OK" (stage **1910**). The CHUMBY™ device then transmits the encoded pattern along with the putative id (unique serial number) of the CHUMBY™ device to the server for verification and association with the user's account. Alternatively, the user may directly enter the putative id (unique serial number) of the user's CHUMBY™ device into the Web page and selects "OK" (stage **1910**). An association is then created between the user's CHUMBY™ device and the applicable account within the system database **712**.

In one embodiment user accounts are configured to be capable of hosting and moderating sub-accounts.

Disabling a CHUMBY™ Device

Referring now to FIG. **20**, a flowchart is provided of exemplary Web-based interaction occurring between a user and the service provider **106** with regard to disabling a CHUMBY™ device that has been previously associated with the user's account. As shown, the user logs in to the account via a Web browser **122** (stage **2002**) and selects a "Disable CHUMBY™ device" tab or the equivalent (stage **2004**). The user then selects the CHUMBY™ device to be disabled from a list based upon either the device's serial number or description (stage **2006**). Next the user is prompted to confirm the selection (stage **2010**), and if so all references to the disabled CHUMBY™ device are removed from the directory maintained within the system database **712** (stage **2014**). The process is then completed whether or not the selection is confirmed (stage **2020**), at which point the service provider **106** no longer responds to requests from the CHUMBY™ device which has been disabled.

Mirroring a CHUMBY™ Device

FIG. **21** IS a flowchart which represents exemplary Web-based interaction occurring between a user and the service provider **106** in connection with "mirroring" CHUMBY™ devices; that is, enabling one CHUMBY™ device to utilize the widget set and configuration of another CHUMBY™ device. In one embodiment once a given CHUMBY™ device (i.e., the "slave device") has been mirrored to another CHUMBY™ device (i.e., the "master device"), widget-related changes made to the master device are automatically reflected in the slave device. As shown in FIG. **21**, the user logs in to the applicable account via a Web browser **122** (stage **2102**) and selects a "Mirror this CHUMBY™ device" tab or the equivalent (stage **2104**). The user then selects the CHUMBY™ device to be the "master" (stage **2108**) and further selects the CHUMBY™ device to the "slave" (stage **2112**). In certain embodiments the master CHUMBY™ device need not correspond to a physical device, but could instead constitute a "virtual" CHUMBY™ device defined within the system database **712**. In this case changes made to the widget set or configuration of the virtual CHUMBY™ device would be mirrored by all of its slave CHUMBY™ devices. In certain embodiments the slave CHUMBY™ device need not correspond to a physical device, but could instead constitute a "virtual" CHUMBY™ device defined within the system database **712**.

Widget Selection, Removal and Configuration

Attention is now directed to FIGS. **22-25**, **37** and **38**, which are a set of flowcharts representative of Web-based widget selection, removal and configuration processes contemplated by embodiments of the present invention. Screen shots of exemplary user interfaces presented by the Web browser **122** or, alternatively, the screen **320** of the applicable CHUMBY™ personal audiovisual device **102**, which are used to facilitate certain of these processes are illustrated in FIG. **26**.

Overview of Widget Management Process

Turning now to FIG. **22**, a top-level flowchart **2200** is provided of exemplary Web-based interaction occurring between a device user and the service provider **106** with regard to adding, removing and configuring widget profiles relative to the user's CHUMBY™ device. Alternatively, this interaction between a device user and the service provider **106** may be effected through user interface screens presented by the user's CHUMBY™ device in lieu of the Web browser **122**. Although a user may have the impression that a CHUMBY™ device itself is being configured through the process of FIG. **22**, in the exemplary embodiment a profile currently assigned to the user's CHUMBY™ device is instead configured.

As shown in FIG. **22**, the user logs in to the user's account maintained with the service provider **106** via a Web browser **122** (stage **2202**) and proceeds to the user's "home page" or the equivalent (stage **2204**). From this home page the user selects a "Set Up" device tab or the like (stage **2208**) and the Web browser **122** presents a corresponding "Set Up" page (stage **2210**). The user then selects the CHUMBY™ device profile to be configured from a list based upon either the device's serial number or description (stage **2212**). The current configuration for the selected device profile is then retrieved from the system database **712** and loaded into the device (stage **2216**). Once this has occurred the user selects an action to be performed, as is illustrated by FIG. **26**A (stage **2220**). Such actions may include, for example, adding, deleting or editing widget profiles. If the user opts to add widget profiles (stage **2224**), then the Web browser **122** displays an "Add Widgets Page" through which widget profiles may be added to the current configuration of the applicable CHUMBY™ device in the manner described below with reference to FIG. **23** (stage **2228**). If the user instead chooses to delete widget profiles from such current configuration (stage **2232**), then a "Delete Widgets Page" is presented through which the deletion operation may be completed consistent with the approach described below with reference to FIG. **24** (stage **2236**). Alternatively, the user may select another CHUMBY™ device profile to configure (stage **2240**), or simply exit and return to the user's home page (stage **2244**).

Turning now to FIG. **37**, an alternate top-level flowchart **3700** is provided of exemplary Web-based interaction occurring between a device user and the service provider **106** with regard to adding, removing and configuring widget profiles relative to the user's CHUMBY™ device. Although a user may have the impression that a CHUMBY™ device itself is being configured through the process of FIG. **37**, in the exemplary embodiment a profile currently assigned to the user's CHUMBY™ device is instead configured.

As shown in FIG. **37**, the user logs in to the user's account maintained with the service provider **106** via a Web browser **122** (stage **3702**) and proceeds to the user's "MY CHUMBY™ page" or the equivalent, as is illustrated by FIG. **39**A (stage **3704**). From this MY CHUMBY™ page the user optionally selects the CHUMBY™ device to be configured from a list or the like, as is illustrated by FIG. **39**B (stage **3706**) and the Web browser **122** loads the currently configured widget channel into the current page (stage **3708**). The user then optionally selects the CHUMBY™ widget channel to be configured from a list or the like, as is illustrated by FIG. **39**C (stage **3710**). The current channel configuration for the selected CHUMBY™ device is then updated in the system database **712**, loaded into the current page (stage **3712**) and loaded by the currently selected CHUMBY™ device (stage **3713**). At any point the user may select the "Edit Channel" option (stage **3714**), following which a "Edit Channel Page" is presented, as is illustrated by FIG. **39**D (stage **3716**), with the widget configuration for the selected channel is loaded into the page (stage **3718**). Once this has occurred, the user may select an action to be performed (stage **3720**). Such

actions may include, for example, changing, renaming, deleting or creating new widget channels; adding widgets to, removing widgets from, changing playback order of widgets within or configuring widgets within the selected channel. If the user opts to perform a widget action (stage **3724**), then the widget instance for the affected widget and/or the configuration for the selected channel within the system database **712** are updated, which subsequently effects a corresponding update to the local copy of the channel configuration of all CHUMBY™ devices currently "playing" the selected channel (stage **3728**). If the user opts to perform a channel action (stage **3732**), then the configuration for the selected channel within the system database **712** is updated which subsequently effects a corresponding update to the local copy of the channel configuration of all CHUMBY™ devices currently "playing" the selected channel (stage **3734**). Alternatively, the user may select another channel to configure (stage **3740**), or navigate to another page (stages **3742**, **3744**).

Adding Widgets

FIG. **23** is a flowchart **2300** representative of exemplary Web-based interaction occurring between a device user and the service provider **106** with respect to the addition of widgets to the current configuration of the user's CHUMBY™ device. Alternatively, this interaction between a device user and the service provider **106** may be effected through user interface screens presented by the user's CHUMBY™ device in lieu of the Web browser **122**. In one embodiment the user is provided with the opportunity to choose, through an appropriate category selection page (see, e.g., FIG. **26**B) presented by a Web browser **122**, among various widget categories retrieved from the categories table of the system database **712** (stage **2302**). After selecting a widget category (stage **2304**), both the widgets included within the selected category and the current widget configuration of the applicable CHUMBY™ device are presented to the user (stage **2308**). The user then selects an action to perform (stage **2312**) including, for example, exiting the widget addition process (stage **2316**) or navigating the list of widgets presented for the selected category (stage **2320**). If the latter action is selected (see, e.g., FIGS. **26**C-**26**D), the user then selects a widget to be added to the current configuration (e.g., by selecting a corresponding icon) and the service provider **106** constructs an instance of the selected widget (stage **2324**). At this point the user may also opt to add yet more widgets to the current configuration (stage **2328**). Once the user has indicated that no additional widgets are to be added, a widget configuration phase (stage **2332**) may be entered (see, e.g., FIG. **26**E). If the user declines to select a widget while navigating the list of widgets presented for a selected category during stage **2320**, a new category of widgets may be selected (stage **2340**).

If the user decides to exit the process of adding widgets to the current configuration, the user may perform one of several actions, including, but not limited to: select another CHUMBY™ device to configure; navigate to another page on the CHUMBY™ site; log out from the CHUMBY™ site; or close the applicable browser window (stage **2316**). If the user instead chooses to save the current widget configuration for the applicable CHUMBY™ device (stage **2350**), the user selects a "Submit", "Commit", "Ok" or similar button to cause any changes made to be recorded in the system database **712** (stage **2354**). After either saving the current widget configuration or electing to exit the process, the user may be directed to a predefined page (stage **2360**).

FIG. **38** is an alternate flowchart **3800** representative of exemplary Web-based interaction occurring between a device user and the service provider **106** with respect to the addition of widgets to a channel configuration. In one embodiment the user is provided with the opportunity to choose, through an appropriate category selection list on the EDIT CHANNEL Page (see, e.g., FIG. **39**D) presented by a Web browser **122**, among various widget categories retrieved from the categories table of the system database **712** (stage **3802**). After selecting a widget category (stage **3804**), the widgets included within the selected category are presented to the user, as is illustrated by FIG. **39**F (stage **3808**). The user then selects an action to perform including, for example, navigating to another page (stage **3832**) or navigating the list of widgets presented for the selected category (stage **3812**). If the latter action is selected (see, e.g., FIG. **39**G), the user then selects a widget to be added to the current configuration by selecting a widget from the "widgets" list (stage **3816**), which causes the selected widget to be displayed (stage **3820**), and then selecting the ADD TO CHANNEL button (stage **3824**), which causes the service provider **106** to construct an instance of the selected widget and update the configuration for the current channel in the system database **712** (stage **3828**). At this point the user may also opt to iteratively navigate the widget list (stage **3812**), select widgets (stage **3816**) and add more widgets to the current configuration (stage **3824**). At any time in this process, other widget and/or channel operations may be selected and/or executed by the user (stage **3840**), including, but not limited to: configuring a widget instance (see, e.g., FIG. **39**H), a widget deletion, altering widget playback ordering within the channel, renaming the current channel, deleting the current channel, creating a new channel and/or selecting a new category of widgets may be selected (stage **3850**).

If the user decides to exit the process of adding widgets to the current configuration, the user may perform one of several actions, including, but not limited to: select another channel to configure, as is illustrated by FIG. **39**E; navigate to another page on the CHUMBY™ site (stage **3832**); log out from the CHUMBY™ site; or close the applicable browser window.

Widget Removal

Referring now to FIG. **24**, a flowchart **2400** is provided which is representative of exemplary Web-based interaction occurring between a device user and the service provider **106** in connection with the removal of widgets from the current configuration of the user's CHUMBY™ device. Alternatively, this interaction between a device user and the service provider **106** may be effected through user interface screens presented by the user's CHUMBY™ device in lieu of the Web browser **122**. Upon being presented with the "EDIT CHANNEL Page", as is illustrated by FIG. **39**D (stage **2402**), the user may elect to either de-activate a selected widget (stage **2406**), delete (or remove) a selected widget (stage **2410**), or select some other widget, channel and/or page navigation operation (stage **2414**). If widget de-activation is chosen, the user is prompted to confirm the choice (stage **2418**). Once such confirmation has been provided the widget is marked as "inactive" on the page currently being rendered by the Web browser **122** (stage **2420**). In addition, the widget instance configuration for the selected channel is updated within the system database **712** (stage **2424**) and any CHUMBY™ devices currently displaying the selected channel are updated. Similarly, if it is instead chosen to delete the selected widget, the user is optionally prompted to confirm the choice (stage **2438**). Once the widget is deleted or after optionally required confirmation has been provided, the widget is removed from the page currently being rendered by the Web browser **122** (stage **2440**), the widget instance is "deleted" from the channel configuration in the system database **712** (stage **2424**) and any CHUMBY™ devices currently displaying the selected channel are updated. If confirmation to de-activate or delete the selected widget is required, but not provided (stages **2418** and **2438**), the operation is aborted.

Referring now to FIG. **41**, an alternate flowchart **4100** is provided which is representative of exemplary interaction occurring, via the CHUMBY™ device of a user, between such user and the service provider **106** in connection with the removal of widgets from the current configuration of the user's CHUMBY™ device. With a widget displayed on the screen **320** of the CHUMBY™ device (stage **4102**), the user

performs the gesture which selects the Control Panel (stage **4104**). Upon being presented with the Control Panel, as is illustrated by FIG. **40**A (stage **4108**), which displays the avatar for the current widget (stage **4112**), the user may optionally use the widget navigation controls to singly or iteratively select a new current widget (stage **4116**), in which case the new current widget is loaded (stage **4120**) and its avatar displayed (stage **4112**). The user may then elect to delete (or remove) the current widget by selecting DELETE (stage **4124**). If widget deletion is chosen, the user is prompted to confirm the choice, as is illustrated by FIG. **40**B (stage **4128**). If the user confirms the deletion (stage **4132**), the widget instance is deleted from the channel on the CHUMBY™ device and the widget instance is "deleted" from the channel configuration in the system database **712** (stage **4136**). If confirmation is not provided, the operation is aborted. At this point, the delete confirmation screen is exited (stage **4140**) and the Control Panel is displayed. The user has the option to select HIDE CONTROL PANEL (stage **4144**), which exits the control panel and resumes normal widget play.

Widget Configuration

FIG. **25** is a flowchart **2500** depicting an exemplary set of operations involved in configuring parameters specific to of one or more widgets currently associated with a given CHUMBY™ device. The process is initiated by accessing the configuration of a selected widget instance maintained within the system database (stage **2502**). An appropriate user interface through which the existing configuration of the selected widget may be edited is then generated based upon such existing configuration (stage **2504**). This may involve, for example, establishing various inter-field dependencies based upon the existing configuration (stage **2508**). Once the user interface has been generated it is presented to the user via a Web browser **122** in order to enable desired changes to the configuration to be made, as is illustrated by FIG. **39**H (stage **2512**). If a user elects to edit one or more fields presented by the interface (**2516**), the user interface defining the widget configuration is correspondingly changed (stage **2520**). If a user elects to not edit any of these fields, the user is given the option of selecting a "default configuration" (stage **2524**). To the extent this option is selected, all fields are reset to default values (stage **2528**); otherwise, the user is given the option to exit the process or return to stage **2516** (stage **2540**). When the process is exited, the user is given the option of saving the edited version of the configuration in the system database **712** (stage **2544**). If this option is selected, the current widget configuration is saved to the database **712** (stage **2550**). The "Edit Channel Page" is then presented to the user, irrespective of whether or not the user elected to save the widget configuration (stage **2560**).

In an exemplary embodiment the service provider **106** populates a corresponding widget and parameters tables within the system database in accordance with the user's parameter selections. In this regard the widget table may include an XML-based "param_desc_xml" field containing instructions enabling the construction of associated records in parameters table. For example, for a "clock" widget the XML-based instructions could indicate that a time zone should be a valid parameter, and could also be utilized to create appropriate records in the parameters table.

Distribution of Electronic Greetings Among CHUMBY™ Devices

Users of CHUMBY™ devices will have the ability to send electronic greeting cards in the form of rich Flash animations. Upon visiting a predefined web site (e.g., 'http:/greetings.chumby.com') and optionally being authenticated by presenting appropriate credentials, a user will be presented with a catalog of "CHUMBY™ Greetings". In one embodiment access to certain "CHUMBY™ Greetings" may be dependent on membership status. Any authenticated user, irrespective of the number of registered CHUMBY™ devices, will have the permission to send CHUMBY™ Greetings to one or more arbitrary email addresses or, alternatively, one or more users registered with the CHUMBY™ network. If a visitor to the web site is aware of the globally and temporally unique email address of an existing CHUMBY™ device, the account name in which the CHUMBY™ device is registered, or other means of identifying individual CHUMBY™ devices, they may specify CHUMBY™ Greetings to be forwarded directly to such a device using the existing widget transfer infrastructure of the service provider **106**. Upon receipt at the CHUMBY™ device, the transferred CHUMBY™ Greetings will be added to the channel or profile in which the recipient has designated for receipt of widgets or other delivered content. Once the widget has been delivered to a channel or profile, the recipient will have the option of accepting or rejecting the delivered content. In the event that a user accepts the CHUMBY™, the CHUMBY™ Greeting will be added to the recipient's widget slideshow rotation in accordance with the applicable profile of the device. In one example, a visitor to the web site may choose to assign a certain level of priority to a CHUMBY™ Greeting such that it may be displayed by the recipient CHUMBY™ device immediately following actuation of the device's alarm function. Alternatively, a priority assigned to a CHUMBY™ Greeting may define the placement of the CHUMBY™ Greeting in the recipient's widget rotation.

CHUMBY™ Greetings sent to email addresses that are not bound to physical CHUMBY™ devices will be forwarded as an SMTP email message. This message will originate from, for example, "greetings@chumby.com" (or a user supplied email address), and will contain a URL or hyperlink pointing to a temporary web page hosting the Flash movie comprising the CHUMBY™ Greeting in addition to an optional user-defined message. Authenticated users will have the ability to select one or more peers from their CHUMBY™ "Buddy List" as recipients of a preconfigured CHUMBY™ Greeting. In one embodiment of CHUMBY™ Greetings, a subscription may be required for access to certain features such as CHUMBY™ Greetings. In such an embodiment, users subscribing to the CHUMBY™ Network will have access to "premium" CHUMBY™ Greetings. In one embodiment, CHUMBY™ may wish to elect a "pay-per-view" model where the use of a "premium" CHUMBY™ Greetings may be charged as a micro-transaction. In one embodiment, CHUMBY™ Greeting recipients that are not bound to physical CHUMBY™ devices will be presented with an option to forward the CHUMBY™ Greeting to alternate email addresses or physical CHUMBY™ devices.

Content Transfer from Personal Communication Device to CHUMBY™ Device

In one embodiment the infrastructure of the CHUMBY™ service provider will support a service capable of receiving an email message from a mobile communication device (e.g., a cellular phone) containing text and/or an image. The email would be addressed to a given user (e.g., 'user'@chumby.com) within the "chumby" domain; alternatively, a special email domain may be created for content from mobile devices in order to facilitate its detection (e.g., 'user'@chumby-mobile.com).

Referring to the process flow diagram **3400** of FIG. **34**, a text/image processing service within the infrastructure of the CHUMBY™ service provider **106** is configured to parse e-mail messages from mobile devices and extract the relevant content. As shown, the e-mail messages are provided to a CHUMBY™ e-mail gateway **3410** by provider service gateway **3412**. The text/image processing service makes the con-

tent available to the appropriate widget (mobile text or mobile imaging) and optionally caches that content in a service in the infrastructure of the CHUMBY™ service provider **106**. In the embodiment of FIG. **3400**, such infrastructure includes a text server **3420** and an image server **3430** respectively operative to process textual and image information extracted from incoming e-mail messages by the CHUMBY™ e-mail gateway **3410**. If the recipient user has the appropriate text or imaging widget configured to display on their CHUMBY™ device **102**, then the subject text or image will be retrieved and displayed when the widget becomes active (after all previously queued text or images have been retrieved). If such a widget is not currently configured to run on the recipient user's CHUMBY™ device **102**, the content will remain stored within the appropriate service's cache until such time that the widget is configured to run or a cache aging utility deletes it as unreferenced content.

FIG. **35** is a process flow diagram **3500** illustrating an alternate implementation of an image processing service for CHUMBY™ devices **102**. As shown, in the implementation of FIG. **35** the image processing service may not be performed by the CHUMBY™ service provider **106**, but is instead handled by an imaging service provider **3502**. In particular, e-mail messages originating at mobile devices are provided to an imaging service e-mail gateway **3510** by provider service gateway **3512**. The service provider **3502** also operates an image server **3520** that makes the extracted image content available to the appropriate image widget executing on the applicable CHUMBY™ device **102**.

Internet-Based Automatic Updating of Software on CHUMBY™ Device

In one embodiment the CHUMBY™ service provider is configured to effect automatic updating of the software within each CHUMBY™ device over the Internet and via the applicable wireless LAN.

FIGS. **42**A, FIG. **42**B, FIG. **42**C are flowcharts **4200**A, **4200**B and **4200**C illustrating an exemplary sequence of operations performed to automatically update all or part of the software maintained within non-volatile memory **310** of a CHUMBY™ device. Referring to FIG. **42**C, the CHUMBY™ device being updated is informed by the CHUMBY™ service provider (upon being polled by the CHUMBY™ device) that a firmware update is available (stage **4204**). In the exemplary embodiment both the CHUMBY™ device and the CHUMBY™ service provider are aware of the version of the firmware being used by the CHUMBY™ device. Accordingly, during stage **4204** the CHUMBY™ service provider sets a flag or provides some other indication to the CHUMBY™ device that a firmware update is available for the particular version being utilized by the device, where version may refer to a particular software version, hardware version, putative ID of the device, or a combination thereof. Upon receiving such an update indication, the CHUMBY™ device issues a prompt through the screen **320** inquiring as to whether the user desires to proceed with the auto update process (stage **4206**). If not, normal operation is continued (stage **4210**); if so, the CHUMBY™ device will set a flag on the Persistent Storage Partition (PSP), indicating that software update is available (stage **4211**) and takes steps to reboot into an "auto update" mode during which the updated software will be received. In particular, the CHUMBY™ device sets a semaphore stored by a Mode Sense Page (MSP) maintained by the device (stage **4212**). In the exemplary embodiment setting the MSP semaphore results in the CHUMBY™ device initiating operation in the "auto update" mode upon being rebooted, while clearing the MSP semaphore causes the CHUMBY™ device to initiate a normal mode of operation upon rebooting.

If the MSP semaphore is set pursuant to stage **4212**, the CHUMBY™ device is rebooted (stage **4214**). In the exemplary embodiment, as shown in FIG. **42**A, this is effected by a bootloader, which upon being initialized (stage **4218**) checks the status of the MSP semaphore (stage **4222**) and begins the process of booting the CHUMBY™ device into the auto update mode as shown in FIG. **42**B (stage **4226**). In particular, the initial bootloader loads a kernel image used during the auto update process ("Kernel 2" or "K2") into SDRAM **306** from non-volatile memory **310** and begins execution of K2.

As shown in FIG. **42**B, K2 mounts and initializes a root file system image ("RFS2") used during the auto update process (stage **4230**). In the exemplary embodiment RFS2 will comprise a read-only cramfs file system such that any potential vulnerabilities exploited during the auto update process will typically not survive rebooting of the CHUMBY™ device, thereby enhancing security. The initialization script in RFS2 causes the CHUMBY™ device to attempt to establish a wireless connection with a wireless access point (WAP) in accordance with the configuration stored in a "Persistent Storage Partition" (PSP) (stage **4234**). In one embodiment, if this attempt is unsuccessful, the user is prompted to enter a new WAP configuration or choose from an existing list of preconfigured networks via the touch screen **330**. In such an embodiment this prompting may be effected by executing a Flash movie stored within the non-volatile memory **310**. In the exemplary embodiment, if the network connection attempt is unsuccessful, a Special Options mode will be displayed (stage **4238**) and the user will be prompted with an option to restart to normal operation (stage **4240**). In such an embodiment, if the user chooses to 'restart to normal operation' via the touchscreen **330**, the MSP semaphore is cleared (stage **4254**) and the device is rebooted (stage **4258**).

Once a successful wireless connection has been established, the CHUMBY™ device will check a flag on the PSP as to whether an update was previously determined to be available (stage **4235**). If the flag exists, the CHUMBY™ device will optionally request the URL(s) for the torrent file(s) that represent an compressed binary firmware image and fetch the torrent file from a predefined network location (e.g., http://update.chumby.com/update.torrent) or a supplied URL (stage **4241**); else the CHUMBY™ device will launch the Special Options mode (stage **4238**). If multiple torrent URLs were supplied by the CHUMBY™ Network, the secondary torrent URL will be stored in a file on the PSP. A "torrent" file is a small metadata file—it does not contain the actual data, but rather information about the data, and information about the "tracker", which is a computer that coordinates the behavior of the sharing peers. The computer that provides the torrent file may or may not be the same computer that is the tracker, which may or may not be one of the computers that actually shares data. In the exemplary embodiment the CHUMBY™ device being updated will execute a locally-stored client operative in accordance with the BitTorrent™ protocol to receive the updated firmware for the device (stage **4244**). Consistent with the BitTorrent™ protocol, the 'torrent' file will contain a pointer to a CHUMBY™ update torrent tracker and will specify chunk sizes and hashes associated with the various portions of the updated firmware to be received. When the 'torrent' file is loaded by the BitTorrent™ client (stage **4244**), the full size of contiguous binary image will be optionally pre-allocated directly in non-volatile memory **310** (e.g., NAND flash). As the BitTorrent™ client downloads a given chunk of the updated firmware of the CHUMBY™ device, the chunk will be validated against a hash and written to the non-volatile memory **310**; otherwise, the chunk is re-fetched. Once the BitTorrent™ client has exited, the exit code of the BitTorrent™ client is checked to determine whether the client was successful in downloading the firmware image (stage **4245**). If the BitTorrent™ client exited with a non-zero exit code, the

CHUMBY™ device will fall back to an alternative transport protocol such as HTTP, HTTPS or FTP, etc (stage **4246**). Once the alternative transport client has exited, the exit code will be checked to determine if the image transfer was successful (stage **4247**). If the alternative transport client exited with a non-zero exit code, the CHUMBY™ device will fall back to a redundant alternative transport client (stage **4248**). Once the redundant alternative transport client has exited, the exit code will be checked to determine if the image transfer was successful (stage **4249**). If the image transfer failed, a message indicating that the update was unsuccessful will be presented to the user on the screen **320** (stage **4250**). At this point the user may choose to reboot the device (stage **4251**). Once the optionally compressed binary image of the updated firmware has been completely downloaded by either the BitTorrent™ client (stage **4244**), the alternative transport client (stage **4246**) or the redundant alternative transport client (**4248**) and optionally passes a checksum validation, the CHUMBY™ device being updated will optionally extract the downloaded image and write each applicable partition to the appropriate offset directly in non-volatile memory **310** (stage **4252**). Once all of the available partition images (optionally extracted from the firmware binary image) have been written to the non-volatile memory, the CHUMBY™ device will clear the MSP semaphore (indicating that the CHUMBY™ device should boot into the "normal operation" mode) (stage **4254**).

As shown in FIG. **42**A, upon rebooting of the CHUMBY™ device (stage **4258**), the bootloader will check the MSP semaphore (stage **4222**) then set it as shown in FIG. **42**C (stage **4260**). The boot loader will boot the CHUMBY™ device into "normal operation" mode by loading the primary kernel image active during normal mode operation ("Kernel 1" or "K1") into SDRAM **306** and executing it (stage **2864**). In this regard the MSP semaphore is set to ensure that a failed attempt to boot the CHUMBY™ device into normal mode operation will force the device to next be booted into the "auto update" mode, hence avoiding an indefinitely long sequence of failed attempts to boot the device into normal mode operation due to a corrupted kernel or file system, premature power loss, or other device failures. As indicated by FIG. **42**C, "Kernel 1" mounts into SDRAM **306** and initializes a primary root file service image ("RFS1") active during normal mode operation (stage **4270**). The initialization script in RFS1 causes the CHUMBY™ device to attempt to establish a wireless connection with a wireless access point (WAP) in accordance with the configuration stored in a "Persistent Storage Partition" (PSP) (stage **4271**). In the exemplary embodiment, if the wireless connection attempt is unsuccessful, the MSP semaphore is cleared (stage **4216**) and the user may optionally be prompted to enter a new WAP configuration or choose from an existing list of preconfigured networks via the touch screen **330**. If the wireless connection attempt is successful, the CHUMBY™ device will check a file stored in the PSP to determine whether an update is required (stage **4272**). The file stored in the PSP may optionally contain pointers one or more URLs which identify firmware binary images or a torrent file. If the file in PSP exists and references a torrent URL, the CHUMBY™ device will download the torrent file via a transport protocol such as HTTP, HTTPS or FTP, etc (stage **4273**). In the exemplary embodiment the CHUMBY™ device being updated will execute a locally-stored client operative in accordance with the BitTorrent™ protocol to receive the updated firmware for the device (stage **4274**). Consistent with the BitTorrent™ protocol, the 'torrent' file will contain a pointer to a CHUMBY™ update torrent tracker and will specify chunk sizes and hashes associated with the various portions of the updated firmware to be received. When the 'torrent' file is loaded by the BitTorrent™ client (stage **4274**), the full size of contiguous binary image will be optionally pre-allocated directly in non-volatile memory **310** (e.g., NAND flash). As the BitTorrent™ client downloads a given chunk of the updated firmware of the CHUMBY™ device, the chunk will be validated against a hash and written to the non-volatile memory **310**; otherwise, the chunk is re-fetched. Once the BitTorrent™ client has exited, the exit code of the BitTorrent™ client is checked to determine whether the client was successful in downloading the firmware image (stage **4275**). If the BitTorrent™ client exited with a non-zero exit code, the CHUMBY™ device will fall back to an alternative transport protocol such as HTTP, HTTPS or FTP, etc (stage **4276**). Once the alternative transport client has exited, the exit code will be checked to determine if the image transfer was successful (stage **4277**). If the alternative transport client exited with a non-zero exit code, the CHUMBY™ device will fall back to a redundant alternative transport client (stage **4278**). Once the redundant alternative transport client has exited, the exit code will be checked to determine if the image transfer was successful (stage **4279**). If the image transfer failed, a message indicating that the update was unsuccessful will be presented to the user on the screen **320** (stage **4280**). At this point the user may choose to reboot the device (stage **4281**). Once the optionally compressed binary image of the updated firmware has been completely downloaded by either the BitTorrent™ client (stage **4274**), the alternative transport client (stage **4276**) or the redundant alternative transport client (**4278**) and optionally passes a checksum validation, the CHUMBY™ device being updated will optionally extract the downloaded image and write each applicable partition to the appropriate offset directly in non-volatile memory **310** (stage **4282**). Once all of the available partition images (optionally extracted from the firmware binary image) have been written to the non-volatile memory, the CHUMBY™ device will clear the MSP semaphore (indicating that the CHUMBY™ device should boot into the "normal operation" mode) (stage **4216**). Once the MSP semaphore is cleared, the CHUMBY™ device will continue into normal operation (stage **4210**).

In one embodiment more than a single bootloader routine may be run to effect the process of booting the CHUMBY™ device. In particular, upon the CHUMBY™ device exiting a reset state, an initial bootloader (BL) may be executed from a predefined location in non-volatile memory **310** which initializes SDRAM **306**, copies a second bootloader (2BL) to SDRAM **306**, and executes a jump to the 2BL. The 2BL executes out of the SDRAM **306** and in such an embodiment performs at least the following functions:

(i) Clears screen frame buffer of the CHUMBY™ device.

(ii) Displays a logo screen

(iii) If BIST routines are implemented, and the manufacturing test pin is pulled up, copy a test partition (TST) into memory and jump to TST code.

(iv) Checks touchscreen **330** for touch. If the touchscreen **330** is being touched, then in an exemplary embodiment the following message is displayed: "Continue to hold touch screen to enter auto-update. Release screen to continue." After a predetermined number of seconds (e.g., 4), proceed to stage **4226** of FIG. **42**B (i.e., AUTOUPDATE MODE load/execute K2) if touch screen **330** continues to be touched; otherwise proceed to stage **4222** (i.e., check MSP semaphore).

While the MSP partition needs to store just a single bit, the implementation of the MSP should reflect the limitations of the physical media device used to store the MSP. In this embodiment, a block-erase device with fault-tolerance mechanisms is employed (e.g., a NAND FLASH device). Since it is impossible to erase just a single bit on a block-erase device, the bit is actually implemented as several erase blocks. The partition is also located at the highest point in memory in order to prevent evolving bad blocks from causing the MSP offset to move unpredictably, as the bad block replacement strategy used in most NAND FLASH devices is to replace the logical block by shifting the offset of all the physical pages up by one. All of the erase blocks are programmed to the 1 or the 0 state to represent a set or a clear

state. However, since the MSP is top-aligned, there is no space to do block replacement in case one block goes bad. Therefore, the MSP is actually implemented as a voting algorithm, where the entire set of storage blocks are read back regardless of the state of the bad block mark, and the number of 1's are compared against the number of 0's read, and the majority vote wins. The bad block markings can be ignored for this case because typically only a tiny fraction of a block will fail, leaving the majority of the data in the block pristine. Finally, due to the unpredictability of the bad block evolution in the hardware and the particular mechanism chosen to handle this, there is no filesystem structure written into the MSP. The MSP is mounted as a single binary partition and managed through low-level (e.g., direct binary write, read, and erase) operations.

Set forth below are exemplary partition specifications and an accompanying list of defined terminology applicable to the exemplary embodiment of the invention described with reference to FIG. **42**.

TERMINOLOGY

- K1—Primary kernel image, active during normal user operation
- RFS1—Primary root file service (FS) image, active during normal user operation
- K2—Kernel image used by the autoupdater
- RFS2—Root FS image used by the autoupdater
- BL—Initial bootloader (hardware init, copies boot sectors from FLASH and jumps to 2BL)
- 2BL—Second bootloader
- PSP—Persistent storage partition
- TST—Test partition
- MSP—Mode sense page, used to store a semaphore passed between
- 2BL, K1, and K2 to set boot state of CHUMBY™ device. MSP semaphore clear=>normal operation; set=>autoupdate operation.
- CFP—Flash player of CHUMBY™ device

Exemplary Partition Specifications

PSP

Format: JFFS2

- wireless/WEP/WPA/static IP configuration
- time zone
- GID
- emulated SIM data, accessed by kernel
- crontabs
- boot flags
- volume/pan/mute controls
- touch screen settings
- automatic update flags
- hostname
- udev rules

MSP

Format: binary, in some embodiments accessed through /dev/msp driver in kernel mode, in other embodiments accessed via binary disk operations via the MTD interface from user mode, and through direct hardware calls in 2BL.

Reliably stores one bit, autoupdate or normal mode.

K2

Format: binary

Contains "golden" auto-update kernel, with hardware support for the following features:

- USB
- WiFi
- Display
- Touchscreen
- JFFS2
- cramfs
- MTD
- /dev/msp
- SDRAM memory disk for scratch storage
- console driver through UART

This kernel image is meant to be never overwritten

RFS2

Format: cramfs

This partition is read-only, so a CHUMBY™ device owned in auto-update mode cannot be corrupted. All temporary storage occurs through the SDRAM disk.

Contents:

- custom BitTorrent™ updater client (see below for specifications)
- BitTorrent™ config info
- Animations for relaying update progress and error messages to the user
- sha1 sum
- busybox binary with basic services
- autoupdate scripts that check for kernel, filesystem versions and initiate the proper update procedure based upon the freshness of the binaries.

K1

Format: binary

This is the normal user-mode CHUMBY™ kernel. Autoupdating requires this kernel to support /dev/msp so the MSP semaphore can be set upon starting the Flash player of the CHUMBY™ device.

RFS1

Format: JFFS2

This is the normal user-mode CHUMBY™ file system

TST

Format: binary

See below section on TST partition.

BitTorrent™ Client

A conventional BitTorrent™ client used for updating a CHUMBY™ device is modified to support the following requirements:

- Exit upon completion of download
- Direct access to frame buffer for the purposes of displaying status messages and progress bars.

Library:

- http://www.rasterbar.com/products/libtorrent.html

TST Partition

The TST partition is a statically-linked binary file that operates in absence of any kernel or drivers.

The hardware provides the following test visibility points:

- Pogo pin test points for the following:
  - All DC regulator voltages
  - Status LED output
  - Touchscreen IRQ
  - Serial UART interface
  - Reset button
  - Clock and hsync, vsync to LCD
- Chumbilical™

The test program run by the tester checks the following parameters:

0. Asserts reset and test enable test point
1. Voltages within tolerance
2. Current draw from Chumbilical™ within reset spec
3. Releases reset
4. Current draw from Chumbilical™ within operational spec
5. Status LED toggle by BL
6. Checks for serial output from UART interface
7. Electrically checks for test tone on Chumbilical™ audio output
8. Checks for integrity of LCD timings
9. Checks for correct TS IRQ polarity
10. Checks for and records final test status from TST program

Thus, the TST program performs the following operations:

Relay proper information through UART to tester

Configure CODEC and play test tone

Configure LCD and display test image

Configure touchscreen

Tests SDRAM by writing patterns to memory

(optional) reads FLASH and checks ECC across all blocks for FLASH integrity

Relay all test results to UART

The foregoing description, for purposes of explanation, used specific nomenclature to provide a thorough understanding of the invention. However, it will be apparent to one skilled in the art that the specific details are not required in order to practice the invention. In other instances, well-known circuits and devices are shown in block diagram form in order to avoid unnecessary distraction from the underlying invention. Thus, the foregoing descriptions of specific embodiments of the present invention are presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, obviously many modifications and variations are possible in view of the above teachings. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated. It is intended that the following Claims and their equivalents define the scope of the invention.

What is claimed is:

1. A method, performed by at least one processor of an electronic device, the method comprising:

booting the electronic device into an update mode in response to a flag indicating that an update to operating software of the electronic device is available, the update mode provided from an execution of update software on the electronic device, wherein the update software is stored in a first portion of a non-volatile memory of the electronic device;

updating the operating software of the electronic device, wherein the updating of the operating software is performed in the update mode, and wherein the operating software is stored in a second portion of the non-volatile memory of the electronic device;

resetting the flag to indicate that no additional update to the operating software of the electronic device is available;

attempting to reboot the electronic device into a normal mode, wherein the operating software is configured to be executed in the normal mode, the operating software stored in the second portion of the non-volatile memory having been updated to reflect the updating of the operating software; and

rebooting into the update mode and re-attempting to update the operating software of the electronic device, if attempting to reboot the electronic device into the normal mode fails and the flag indicates that no additional update to the operating software of the electronic device is available.

2. The method of claim **1**, wherein the flag is determined from data values stored in a plurality of memory blocks.

3. The method of claim **2**, further comprising determining a count of memory blocks in the plurality of memory blocks that are set to a determined value and a total count of memory blocks in the plurality of memory blocks.

4. The method of claim **3**, wherein the flag indicates an update is available when the count of memory blocks in the plurality of memory blocks that are set to the determined value is greater than half the total count of memory blocks in the plurality of memory blocks.

5. The method of claim **1**, further comprising, setting the flag to indicate an update is available, if attempting to reboot the electronic device into the normal mode fails.

6. The method of claim **5**, further comprising, rebooting the electronic device into the update mode and repeating the updating of the operating software of the electronic device.

7. An electronic device, comprising:

a processor;

a memory configured for maintaining a flag, the flag indicating whether an update to operating software of the electronic device is available;

a storage memory providing software instructions for execution with the processor in an update mode and a normal mode, including instructions for:

booting into the update mode from a first place in the storage memory in response to the flag indicating that the update is available;

updating the operating software of the electronic device;

resetting the flag to indicate no additional update is available for the operating software of the electronic device; and

attempting to reboot into the normal mode from a second place in the storage memory having applied the updating to the operating software of the electronic device, wherein the normal mode is configured to execute the operating software of the electronic device;

rebooting into the update mode and re-attempting to update the operating software of the electronic device if attempting to reboot into the normal mode fails and the flag indicates that no additional update is available for the operating software.

8. The electronic device of claim **7**, wherein the storage memory further includes instructions for rebooting into the update mode, if attempting to reboot into the normal mode fails.

9. The electronic device of claim **7**, wherein the flag is determined from data values stored in a plurality of memory blocks.

10. The electronic device of claim **9**, wherein the storage memory further comprises instructions for determining a count of memory blocks in the plurality of memory blocks that indicate a particular value and a count of memory blocks in the plurality of memory blocks.

11. The electronic device of claim **10**, wherein the flag indicates an update is available when the count of memory blocks in the plurality of memory blocks that indicate the particular value is greater than half the count of memory blocks in the plurality of memory blocks.

12. The electronic device of claim **7**, wherein the storage memory further includes instructions for setting the flag to indicate an update is available for the operating software of the electronic device, if attempting to reboot into the normal mode fails.

13. The electronic device of claim **12**, wherein the storage memory further includes instructions for rebooting into the update mode and repeating the updating to the operating software, if attempting to reboot into the normal mode fails.

14. A non-transitory machine-readable medium including instructions for receiving information, which when executed by a machine, cause the machine to:

boot the machine into an update mode in response to a flag indicating that an update is available, the update mode provided from executable instructions stored in a first logical storage unit in a memory of the machine;

update software of the machine stored in a second logical storage unit in the memory of the machine;

reset the flag to indicate that no additional update to the software of the machine is available; and

attempt to reboot the machine into a normal mode, the normal mode provided from executable instructions

stored in the second logical storage unit, the second logical storage unit having applied the update to the software; and

rebooting into the update mode and re-attempting to update the operating software of the electronic device, if attempting to reboot the electronic device into the normal mode fails and the flag indicates that no additional update to the operating software of the electronic device is available.

15. The non-transitory machine-readable medium of claim **14**, further including instructions which when executed by the machine cause the machine to reboot into the update mode if operations to attempt to reboot into the normal mode fail.

16. The non-transitory machine-readable medium of claim **14**, wherein the flag is determined from data values stored in a plurality of memory blocks of the machine.

17. The non-transitory machine-readable medium of claim **16**, including instructions which when executed by the machine cause the machine to determine a count of memory blocks in the plurality of memory blocks that are set and a count of memory blocks in the plurality of memory blocks.

18. The non-transitory machine-readable medium of claim **17**, wherein the flag indicates an update is available when the count of memory blocks in the plurality of memory blocks that are set is greater than half the count of memory blocks in the plurality of memory blocks.

19. The non-transitory machine-readable medium of claim **14**, including instructions which when executed by the machine cause the machine to set the flag to indicate an update is available if operations to attempt to reboot into the normal mode fail.

20. The non-transitory machine-readable medium of claim **19**, including instructions which when executed by the machine cause the machine to reboot into the update mode and repeat the update to the software of the machine stored in the second logical storage unit.

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